

## Tomaž Podobnikar – Curriculum Vitæ

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*I am fascinated by innovation and science. What could be more satisfying than unravelling a problem that was considered unsolvable? A deep understanding of natural and social phenomena in geospace over time is paramount before discovering viable technical solutions. Taking a wide-ranging perspective, I discovered that art and science make excellent bedfellows.*

Geospatial Information Expert – consultant, civil servant, Scientific Councillor, lecturer and supervisor (PhD, MSc, BSc), recently a **Sustainable Development Officer** with **25+ years of experience** in the areas of geospatial, environmental, natural and social sciences/fields, Earth observation, hazard and risk management, project/programmes evaluation, etc. at 13 academic, governmental, NGO, IGO (UN) and consulting organizations in 9 countries. **Simplifier and constructor** of new algorithms. Able to build every aspect of digital, from the **front end to the back end and everything in between**. Career highlights include **strong leadership** (head of the dept., chief GIS). Fieldwork in ecological, archaeological, anthropological and geomorphological mapping, geodetic survey and humanitarian in **resource-limited settings**. Designed and delivered courses in GIS/RS, cartography, spatial data and information quality, and digital terrain modelling. Documented innovative methods and technical solutions: [1] spatial data integration/conflation with semantic enrichment to **reduce the cost of digital elevation model (DEM) up to 25-times**, realized for the National DEM and implemented into the EU and Google Earth models; [2] geomorphometry based index for feature detection and recognition, visualization and photography enhancement, used in the Esri World Topographic Map; [3] methodology to pre-process any geospatial data with special tools to make them 'analytics ready', realized for the ESCWA Spatial Data Infrastructure and will be realized with ESA (€150m). Awarded with over 25 competitive grants including Skolkovo Innovation Center and **Fulbright**.

### Core Skills and Qualifications

- A proficient, self-motivated worker, **researcher, officer, teacher** (lecturer, supervisor), **trainer, consultant**, communicator.
- **Team leader** (Head of the dept., Chief GIS and other leaderships) and **team player; cross-disciplinary** and **multicultural** involvements; governance.
- **Designed and managed** 30+ and contributed to 100+ international projects, of which 20+ with industry.
- **Evaluated** 75+ scientific and industrial international projects.
- **Publications:** [Google Scholar](#), [Semantic Scholar](#), [ORCID](#), [ScopusID](#), [ResearcherID](#), [COBISS](#); **1600+ citations** **H-index 20** with the most cited paper being cited 119-times; **editorial board of 7 journals**, edited 8 monographs/special issues, **reviewed 210+ papers**.
- **Fields of interest:** applied sciences (natural, social, environmental, engineering), Geosciences, Geoinformatics, Geomatics, GIScience, GIS, cloud GIS, Earth Observation, geospatial data science, Spatial Data/information/knowledge Infrastructure (SDI), Spatial Data Engineering, geodesign, algorithm design, spatial database design and management, GIS, remote sensing, geomorphometry, photogrammetry, Lidar, cartography, satellite image processing, location-based services, GeoAI and machine learning, spatial generalization, spatial reasoning, cognition and decision making; satellite **geodesy** (GNSS), surveying and mapping; computer programming, VM, AR and VR, environmental geography, hazard and risk management, spatial modelling for conservation (environment, cultural heritage), climate change issues, space research, landscape archaeology, palaeoenvironmental analysis, social networks.
- **Computer applications:** CAD and database management since 1990, GIS, cartography and RS since 1994, (spatial) statistics since 1996, Lidar since 2003, various visualization software since 1994. Familiar with programming languages like Python and C to bring developed algorithms beyond the limits of common off-the-shelf analytical software.
- **Links:** [ResearchGate](#), [ACADEMIA](#), [Portfolio \(YouTube\)](#), [SCGIS](#)

## Professional Experience

### Ministry of Natural Resources and Spatial Planning, Slovenia

2023-11-23 – current

#### *Undersecretary*

Direct assistance in managing professional tasks within the scope of the ministry's or internal organizational unit's work. Leading project teams. Participation and execution of tasks within the Recovery and Resilience Plan "Green Slovenian Location Framework". Independent development of systemic solutions and other most demanding documents. Performing other most demanding tasks. Leading and participating in the most demanding project teams.

Key achievements:

- Supervisory of outsourced companies, all regions' and communities' specialists in Slovenia in the field of the "Intended Land Use".
- I developed and implemented automated standalone software for quality control of various datasets in the biggest Slovenian database, PIS ([https://storitve.pis.gov.si/pis-jv/evidenca\\_stavbnih\\_zemljisc.html](https://storitve.pis.gov.si/pis-jv/evidenca_stavbnih_zemljisc.html)).

### University of Ljubljana, Slovenia

2020-09 – 2021-09; 2023-04 – current

#### *Associate Professor*

Teaching in the doctoral study 'Built Environment', for two courses that I developed: "Digital terrain modelling for natural hazards assessment" (mainly for civil engineers); "Management of spatial data quality" (mainly for geodesists).

Key achievements:

- Supervised international and other PhD students.
- As editor of national and international research and scientific journals, exposed my membership of the editorial board of ISPRS Journal of Photogrammetry and Remote Sensing and MDPI.

### Faculty of Information Studies in Novo Mesto, Slovenia

2008–2019-05; 2020-09–2020-09; 2023-04–curr.

#### *Assistant/Associate Professor*

Lecturing, supervision and research in the undergraduate program. Deliver innovative and effective teaching, teaching curriculum (courses), and learning materials, attracting students from different disciplines and involve GIS in new disciplines curricula. Teaching activities, two courses: "Quality of Information"/"Quality of data" (lectures, tutorials, lab work); "Geographic Information Systems" (lectures, tutorials, lab work).

Key achievements:

- Managed 1 employee (assistant).
- Developed methods for spatial data quality and information quality assessment.

### United Nations, ESCWA, Lebanon

2021-09 – 2023-03

#### *Sustainable Development Officer, Regional Advisor*

Worked for [1] Information Communication Technology Section (ICTS); [2] Statistics, Information Society and Technology dept., and [3] Climate Change and Natural Resource (Arab Centre for Climate Change Policies) dept. Proposed conceptual frameworks for humanitarian risk models, and spatial data infrastructure. Developed optimized solutions for several projects aimed to deliver state-of-the-art GIS and remote sensing solutions. Provided technical solutions for organizational GIS and remote sensing software. Prepared and provided training, lectures, and consultancy on numerous geospatial topics, from GIS roots to cartography, geodesy, photogrammetry, remote sensing, image processing, database development, spatial analytics, visual analytics, geovisualization, etc. Promoted interdisciplinarity and cross-lateral solutions and systematic "geospatial reasoning". Collaboration with UN-GGIM – Arab States and numerous other UN agencies, especially in Lebanon in the fields of GIS, EO, cartography and geodesy.

Key achievements:

- Managed a team of 3 ICT specialists.
- Elucidated the background of geospatial history and contemporary progress to take advantage of geospatial development.
- Through geodesign developed tools/services and algorithms and procedures to improve performance in ongoing projects.
- Reviewed UN-GGIM documents and implemented them to ESCWA.

- GIS capacity building to member states and in-house training on geospatial topics.
- Proposed and developed a scalable and sustainable spatial data/information infrastructure (SDI) solution for the 'ESCWA Geospatial Data Ecosystem' to provide timely 'analytics ready data'.
- Contribution with the geospatial approach to interdisciplinary projects of geospatial SDGs analysis, 'Human development, poverty and multiple shocks in the Arab region – A geospatial analysis', Arab Risk Monitor, and others. Coded automated solutions.

**United Nations, MINUSMA, Mali**

2020-01 – 2020-08

*Chief GIS, Geospatial Information Officer*

Leadership and HR Management. As leader of the GIS Unit, the FTS (Field Technology Section) took on the responsibility of integrating gender perspectives into our work. Collaborated across disciplines with MINUSMA colleagues to achieve our organizational goals, and valued others' ideas and expertise by actively soliciting input. Supported the organization's decisions and shared credit for team accomplishments, while also accepting joint responsibility for team shortcomings. Technological Awareness: Employed an in-depth knowledge of the latest technological developments in GIS, image processing, the internet of things (IoT), GNSS, and web applications. Understand the applicability and limitations of technology in office work and stay up-to-date on available technology, proactively seeking to apply it to appropriate tasks.

**Key Achievements:**

- Managed 12 employees.
- Engaged with technical and administrative leadership of the GIS Unit. By learning about the ongoing work of the unit staff members, their dynamics with clients, I managed them and took advantage of higher level of motivation and participation.
- Proposed and started to implement improvements to geoportal (hub) and cartography techniques.
- This period was also marked by the arrival of coronavirus, which changed some work priorities. Proactively advised a design of the COVID-19 geospatial platform and so initiated numerous activities on this important topic within MINUSMA. Several dashboard prototypes and final solutions were created and deployed for different purposes. Consulting to Mali WHO Country Office on the COVID-19 platform. Outreach of this work is presented in publication "Geospatial for Humanity: Prevention, Response and Recovery of the World from the Pandemic COVID-19", [UN-GGIM 2021](#).
- Strongly involved in various projects activities, especially in Unite Aware and Unite Maps Initiative.

**United Nations Global Service Centre (UNGSC), Italy**

2019-05 – 2020-01

*Geospatial Information Officer*

Managed geospatial databases and provided geospatial platforms, solutions and services to clients. Outreach, business partnerships and partnership with field missions and UNHQ. Supported NYHQ goals for the "Cloud-first" initiative and managed cloud instances as per guidance from NYHQ and SGITT. Employed efficient project and service management. Complied with organizational security regulations. Strengthen the institutionalization of FTS project/program management and associated Governance Process.

**Key Achievements:**

- Resolved various outstanding issues related to governance, software codes, quality assurance, and project design.
- Engaged in supporting and designing the governance process and documentation for managing and deployment of UNGeoPortal ([Unite GeoPortal](#)) in Field Missions.
- Managed to provide valuable input to the definition of processes and guidelines to streamline management of UNGeoPortal. Guided to coordinate and deployed UNGeoPortal Hubs to four missions according to a plan and timeline.
- Created a catalogue of all running UNGeoPortal services allowing better management and transparency.
- Provided a valuable technical contribution to team efforts and projects given to the team. Delivered results based on assigned tasks with expected quality.

**University of Ljubljana, Slovenia**

2009-11 – 2019-06

*Associate Professor*

Worked for Faculty of Civil and Geodetic Engineering, Research Institute of Geoenvironmental and Hydrological Threats – RIGHT (2014-2019), and Department of Geodetic Engineering (2009-2014). As a

researcher, developed advanced methods for spatial models, particularly in fields of geomorphometry, spatial statistics, AI, georadar, and spatial data integration, mostly in the field of degradation of landscapes and hazard management due to climate changes. As a professor, developed courses and taught and supervised students at different levels, such as “Photogrammetry II” (tutorials for graduate students), and many others. Proposed research ideas in the field of flipped and collaborative learning.

Key Achievements:

- As a supervisor attracted the best students in generation from different disciplines. Mentored 15 BSc, 1 MSc, 5 PhD, 1 young researcher.
- Obtained several international research projects and contributed to 10 others, and therefore attracted experts to develop research fields.
- Developed and improved methods for digital elevation model (DEM) production through data and methods integration, with applications. Development geomorphometric methods for natural hazards assessments.
- Published numerous high-level scientific research results. Member of various editorial boards and launched special issues.
- Established a database of historical maps for the area of Slovenia and owned many originals.

**Oxford Policy Management Ltd, United Kingdom**

2013 – 2018

*External Consultant*

Consulting in the fields GIS, spatial predictive modelling, spatial statistics, and environmental science for developing countries, e.g. for “Identifying Frontiers of Digital Financial Services in Tanzania”.

Key Achievements:

- Contributed to geospatial and governance solutions.

**School of Advanced Social Studies in Nova Gorica, Slovenia**

2008 – 2013

*Assistant Professor*

Delivered innovative and effective teaching, teaching curriculum (courses), and learning materials, attracting students and involve GIS in new disciplines curricula. Teaching activities: “Quality of Information” (lectures, tutorials, lab work).

Key achievements:

- Managed 1 employee (assistant)
- Taught students with a social science background on methods of spatial data quality and information quality assessment.

**Scientific Research Centre of the Slovenian Academy of Sciences and Arts, Slovenia**

1995-11 – 2013-06

*Scientific Councillor (Research Advisor), Head of the Department*

Through leadership, management, mentoring, lecturing and supervising, conducted international teams, of researchers, students, technical staff and other stakeholders, and engaged them in projects, programmes, innovative advanced research, studies, applications, conferences, etc. Ensured the development of novel methods in the fields of natural and cultural environment spatial analysis in GIS, geomorphometry, advanced archaeological prediction modelling to optimise the fieldworks, integration of geodetic survey and GIS-based mapping techniques for the fieldworks, etc. Apart from delivering lectures for students, global public and professional audiences and fellows, ensured education in the following subjects for individual postgraduate students: Cartography, GIS and environment, GIS and dialectology, GIS and habitats, at the Faculty of Civil and Geodetic Engineering, Biotechnical Faculty and the Faculty of Philosophy (University of Ljubljana), since 2008.

Key achievements:

- Supervised 2 Leonardo da Vinci Programme students, 3 young researchers, since 2001 and number of students. Lecturer and developed courses for GIS and DEM, Erasmus – Socrates Programme, RESPAL (REmote Sensing for PAst Landscapes), 2006.
- Head of the Department of Environmental Studies, 2008–2013 and member of the Science Council of the Institute of Anthropological and Spatial Studies, 2004–2008. HR activities to build teams.

- Successfully organized several national and international conferences, symposiums and team meetings, e.g. for ISPRS, and Mars Express project. Acquired numerous projects and business agreements, as well as funds used for the development of research activities in the institution.
- Interdisciplinary research results in various fields of sciences and business: Developed innovative data **integration method** and produced a high-accuracy Digital Elevation Model (DEM) of Slovenia and its surroundings in 2005, which was integrated into both the European model and Google Earth model. Designed an inventive online **archaeological mapping technique** for Maya settlements in Yucatan, Mexico, 2004-2005. Designed and applied a large number of innovative GIS layers through **palaeo relief simulations and historical maps reconstruction**, which were used for the film “Nature and the City”, produced by the City Museum of Ljubljana, 2006. Initiated and set up a web GIS server platform for the **Cultural and Natural Heritage Database**, which was used for national purposes and later on for the Archaeological Cadastre of Slovenia (ARKAS), and Maya heritage in Yucatan, Mexico, 2002. Designed an **Archaeological database of Central Dalmatia**, Croatia, 1994. Produced a **special DEM** of Slovenia for mobile communication network planning at national mobile operator Mobitel, and produced numerous derived maps of Slovenia, Europe and Earth for commercial POP TV 2000/2001. Produced a seamless **DEM and bathymetric model** for Central Dalmatia, Croatia with my data integration techniques for the project Adriatic Islands. Similarly, integrated a global bathymetric model using ETOPO and my datasets, for the commercial television station.
- My research outreach, animated simulation effects of sea-level rise on the Slovenian coast, was presented during the visit of Nobel Laureate Al Gore in Slovenia, in 2008.
- Research results were conducted for local communities in Albania, Central America, Croatia, North Macedonia, Papua New Guinea, Slovenia and elsewhere.
- Designed a GIS system for the entire organization, based on Esri solutions and the best national topographic data.

#### **Mura Regional Development Agency Ltd, Slovenia**

2012-10 – 2013-09

##### *Project Manager and Consultant*

A leader and consultant for the application of advanced research in regional development through the EU development project “REG-NET, Slovenia – Hungary”. Preparation and management of project workshops.

##### Key Achievements:

- Designed and developed a web geostatistical/GIS server.
- Proposed and developed environmental indices for natural/social environment assessment.

#### **University of Nova Gorica, Slovenia**

2008-10 – 2011-08

##### *Assistant Professor*

As a fellow at the School of Environmental Sciences in higher education, developed and lectured two courses: “Environmental Information Systems and GIS” with tutorials for undergraduate students, and “Geographic Information Systems” with tutorials for postgraduate students. In addition, lead a team of researchers in an interdisciplinary field after successfully acquired an international project. Managed this project.

##### Key Achievements:

- Managed a team of 5 staff members and successfully supervised 2 BSc students, one of whom won an award.
- Brought an EU multidisciplinary project that I acquired to provide advanced research results, used also for the local community, especially in the field of historical maps and time series analysis with applications in different disciplines.

#### **Vienna University of Technology, Austria**

2007-01 – 2008-12

##### *Project Assistant*

Employed to contribute as a researcher, supervisor and project manager in the series ESA Mars Express projects, as well as in Christian Doppler Laboratory “Spatial Data from Laser Scanning and Remote Sensing”, at the Institute of Photogrammetry and Remote Sensing. The main research topics were: planet Mars exploration, developing algorithms for enhanced digital terrain model (DTM) production and methods for lidar applications development. They included novel methods for quality control, geomorphological extraction of different terrain features, and geovisualization. Other research activities were: remote sensing



applications in invasive plants, applications in environmental archaeology, and natural hazards and risks management applications (launched all 3 projects).

Key Achievements:

- Developed an image processing multi-applicable generic method “**Multidirectional Visibility Index**”, **MVI** that is primarily used for analytical shading enhancement. The method has been used for topographic maps improvement and photography enhancement. A generic algorithm for the MVI was also used in mountain peaks recognition and applied in ESRI World Topo Map. Also designed methods for the **automatic recognition of various geomorphological features**, and for **enhanced visual quality assessment**, as well as for **cartographic visualization, geovisualization and visual analytics**.
- Scientific papers with all specialists in lidar techniques and applications for Comprehensive Utilization of Airborne Laser Scanning in Natural Hazard Studies in Alpine Areas.

**Ministry of Environment, Slovenia**

1995-08 – 1995-11

*Civil Servant*

At the Surveying and Mapping Authority of the RS, involved in operative work, research and administration in various fields, such as geodesy, GIS, photogrammetry, land surveying, cartography, remote sensing, spatial database design and management, and national coordinate systems transformation.

Key Achievements:

- Developed and implemented a catalogue of corners for topographic maps in Slovenia for a scale of 1:25,000.
- Developed various applications for geodesy, land surveying, cartography, and land cadastre.

**International mobility (postdocs, research visits)**

Realized **9 research periods** of at least 1 month, altogether 15 months:

- **Fulbright Visiting Scholar Program** (grant); Department of Marine Geosciences - Rosenstiel School of Marine and Atmospheric Science, University of Miami, USA, 2019
- **Quality Researcher** (grant); C.N.R.S., Laboratoire de Chrono-écologie, Université de Franche-Comté, Besançon, France, 2006
- **Research Expeditions** (National Geographic Society CRE grant); South Campeche, Reserva de la Biósfera de Calakmul, Yucatán and Mexico City, Mexico, 2004 and 2005
- **Visiting Researcher** (grants); Institute of Photogrammetry and Remote Sensing, Vienna University of Technology, Austria, 1999, 2000 and 2001
- **Visiting Researcher** (grant); Faculty of Geodesy, Delft University of Technology, The Netherlands, 1997
- **Research Expedition** (grant); Island of Brač, Croatia, 1994

## Education

**PhD (Doctor of Science)**

University of Ljubljana

1998 to 2001

**MSc in Geodesy**

University of Ljubljana

1995 to 1998

**BSc (Bachelor of Geodetic Engineering)**

University of Ljubljana

1991 to 1995

## Trainings and Certification

**Organizer of 15+ conferences**, trainings and workshops.

Attended training:

- 15 leadership and ethics trainings, since 2007
- 7 management trainings, since 2010
- 15 pedagogical (didactics) trainings, since 2014

- 7 media and communication trainings, since 2010
- 30+ UN trainings, 2019-2023

Attended other training:

- **The use of patent databases and patent information**, by The Slovenian Intellectual Property Office (SIPO), Slovenia, 2017
- **Introduction to ArcGIS Pro for professionals**, by ESRI, UC Davis, USA, 2015
- **Web GIS: Using the ArcGIS Platform**, by ESRI, UC Davis, USA, 2015
- **SIST/ISO standards**, by Slovenian Institute for Standardization (SIST), Slovenia, 2014
- **Perspectives on Spatial Analysis in the Social Sciences**, by Center for Spatially Integrated Social Science, UC Santa Barbara, USA, 2000
- **Introduction to SPSS**, by University of Ljubljana, Slovenia, 1998
- **User applications of ERS SAR Data**, by ESRIN, Frascati, Italy, 1995

## Professional Membership

- **ELISE** (The European Location Interoperability Solutions for e-Government), since 2020
- **European AI Alliance**, since 2018
- **SCGIS** (Society for Conservation GIS), since 2015
- **IUGG** (Slovenian Association of Geodesy and Geophysics), since 2012
- Geomorphological Society of Slovenia, since 2010
- Section for Cartography at the Association of Surveyors of Slovenia, since 2009
- **ICA Commission on Cartography in Early Warning and Crises Management** (International Cartographic Association), since 2009
- **ICA Commission on Generalisation and Multiple Representation** (International Cartographic Association), since 2009
- **ICA Commission on Mountain Cartography** (International Cartographic Association), since 2007
- **EGU** (European Geosciences Union), since 2007
- **IAHS** (International Association of Hydrology Sciences), 2007-2010
- **AGILE** (Association Geographic Information Laboratories Europe), 1998-2012

## Leadership

- **Chief GIS** of GIS Unit, Field Technology Section (FTS), United Nations, Mali, 2020
- **Co-founder** of Vedomec, Institute for the Spatial Culture, Slovenia (on my initiative), 2011-2015
- **Head of the Department of Environmental Studies** of the Institute of Anthropological and Spatial Studies, Scientific Research Centre of the Slovenian Academy of Sciences and Arts, Slovenia (established on my initiative), 2007-2013
- **Science Council** member of the Institute of Anthropological and Spatial Studies, Scientific Research Centre of the Slovenian Academy of Sciences and Arts, Slovenia, 2004-2008

## Editor

**Editorial Board** and member of the scientific committees: Remote Sensing journal, MDPI, [Topic Editor](#), since 2021, and Section Editor "[Remote Sensing in Geology, Geomorphology and Hydrology](#)", since 2019; Geoinformatics FCE CTU, since 2016; IJEES, since 2015; ISPRS Journal of Photogrammetry and Remote Sensing, 2013–2016; Journal of Geodesy, 2010–2014; Geographical Information Systems in Slovenia, since 1997 (also organized biennial symposiums). **Edited** following monographs and special issues:

- [Geospatial Data Quality: Unraveling the Essentials](#), Revue Internationale de Géomatique, 2023
- [Spatio-Temporal Analysis of Urbanization Using GIS and Remote Sensing](#), Special issue, MDPI, 2022
- [Perspectives on Digital Elevation Model Applications](#), Special issue, MDPI, 2021
- [Advances in Global Digital Elevation Model Processing](#), Special issue, MDPI, 2020
- [Universal Ontology of Geographic Space: Semantic Enrichment for Spatial Data](#), monograph, IGI Global, 2012
- Geographical Information Systems in Slovenia, monographic series, ZRC Publishing, 1998, 2000, 2002, 2004, 2006 (5 monographs)

## Expert tasks: Reviewer, Evaluator and Board Membership

**A reviewer** of 49 international journals. Reviewed 210+ papers. Refereed 2 monographs, 7 national and 5 international projects. An **evaluator and a referee** (wrote experts' reports) of **55+ national and 15+ international programmes and projects** (basic research, applied science and industry – R&D) since 2003 (Slovenia, Czech Republic, Belgium, Bulgaria, Croatia, France, Montenegro, Netherlands). Registered an active **expert, evaluator or board member** of:

- EQA (European Quality Assurance), since 2023
- MCST (Malta Council for Science and Technology), 2021-2025 (evaluator board)
- Fulbright: Fulbright Senior Award, 2019, 2021 (evaluator board)
- IBF International Consulting, since 2018
- Montenegrin Ministry of Science, since 2018 (evaluator board)
- COST (European Cooperation in Science and Technology), since 2018 (expert board)
- MSCA-IF (Marie Skłodowska-Curie Individual Fellowships), 2017 call (evaluator board)
- Ministry of Economic Development and Technology, Slovenia, since 2017 (evaluator board)
- SPIRIT Slovenia (Public Agency for Entrepreneurship, Internationalization, Foreign Investments and Technology), since 2017 (evaluator board)
- Ministry of Science and Education, Croatia, since 2017 (evaluator board)
- CMEPIUS, 2016-2020 (evaluator board)
- REGIO (to support Cohesion Policy, regional and urban development) of the European Commission, since 2016 (experts board)
- Horizon 2020 Advisory Groups (European Commission), since 2014 (evaluator board)
- Ministry of the Environment and Spatial Planning of the Republic of Slovenia, "Preparation of the starting points for the recording terrain with lidar", 2010-2011 (Independent government consultant for the high-resolution lidar terrain models)
- ARRS (Slovenian Research Agency), 2003-2008 (evaluator board)

## Innovation

**Multi-source spatial data conflation** (merging with enrichment) novel methodology and computer application for digital elevation model (DEM) production with integration. I have built everything from front-end to back-end and everything in between. The derived landform map has been used nationwide in all high schools and integrated into the European model (EuroDEM – EuroGeographics) and Google Earth model. The reduced cost of the final product by up to 25 times has been realized for the [National DEM of Slovenia](#) (32 data sources!) and Central Dalmatia. The improved solution received "Spatial data integration, Space Technologies and Telecommunications" and "Information Technologies" grants with excellent scores from the Skolkovo Innovation Center (2018). This methodology is one of the future trends in geospatial technology.

**Multidirectional Visibility Index (MVI)**. The generic and multimodal solution is based on a novel [geomorphometric technique](#). I developed the MVI for analytical hill shading and adapted it for predictive modelling (alluvial fans/talus cones), feature recognition and description (mountain peaks, karst depressions), geovisualization (visual quality control) and photography (imagery enhancement with image processing). The solution for the recognition of the geomorphological peaks was used in the Esri World Topographic Map.

**Mapping process with real-time quality control** that employed surveying, GNSS, data sampling and spatial analytics. The [challenges](#) in conducting this method have been in resource-limited settings. I developed that innovative method for ancient Maya settlement models and maps in Yucatan, Mexico, which led to significantly better surveying accuracy and faster mapping.

**Time-series algorithm** for generating GIS layers that involve palaeo relief simulations, automated historical maps analysis and cartographic methods. The results were used for the film "Nature and the City", produced by the City Museum of Ljubljana.

**Participatory management on the relation between individual and group tasks**. The method is based on spatial statistic pattern research, which was involved in crowdsourced data. The main findings were that individuals had better respond to constructive critical judgement, have a deeper understanding and a more



useful approach to creative thinking. Groups are more successful in finding unique differences, where the synergy effect is an important factor. The findings have been used for didactics, mapping purposes, as well as better capacity building.

**Spatial Data Infrastructure (SDI)** with properties: [1] high interoperability; [2] Fundamental Data Themes; [3] standard scale levels; [4] solution to avoid edge effect and boundary problem; [5] standard CRSs and map projections; [6] naming convention; [7] traditional and web maps publishing; [8] metadata and catalog of data/services; [9] files operational for an average laptop. Around 7-times reduced cost and considerably better quality of the final product.

**Selected software**, from architecture to the final product: Coordinate Transformer 1.0, Top Topography (last version 2.0), Visibility Shader (last version 2.0) Peak Mapper (last version: 3.0).

## Funding and Research Projects

Very successful in **obtaining research grants** at national, regional, EU and other international levels. Active participation as a major team player, in **90+ national and international cooperation projects** in Slovenia, Croatia, North Macedonia, Italy, Austria, Hungary, France, Russia, Mexico, Mali, Lebanon, as well as in a project covering the entire Earth and the planet Mars. Worked in different types of groups and alone. This has given me access to very good networks of people from EU countries and other parts of the world.

**Successfully designed and raised competitive research funds for 20+ projects, managed and executed them** (e.g. co-financed by the ERDF: FP6, FP7), and participated in **18+ joint cooperation projects with industry**, co-financed by Skolkovo Foundation, Telekom, DARS, etc. The work includes numerous basic research projects co-financed by FFG/ALR, ASAP, ARRS, etc. Highlighted projects with their acronyms: OBSERVE, PARAMount, TransEcoNet, TMIS.plus.II, TMIS.morph, CAENTI, SISTEMaPARC, Alpine Windharvest, AQUADAPT, ArchaeDyn, Adriatic Island Project, National Program of Water Management – in the framework of Interreg programs, Central Europe, Inter-American Development Bank, National Geographic (CRE grant).

Accepted by **9 competitive start-up projects in the industry** on spatial data handling topics with the following acronyms: SmartDEM (UiG, 2021; Future 4.0, 2020; Skolkovo Foundation, 2014, 2017, 2018) and Top Topography (INiTS, 2019). Using project management tools (MS Project, PlantUML, Open Workbench, JIRA, etc.).

## Spatial analysis and survey-related studies

**Quantitative and qualitative spatial data processing** with the development of novel algorithms and methods for spatial data analysis, spatial statistics, geostatistics, visual analytics, spatio-temporal analysis, network analysis; mathematical modelling; processing of various spatial data layers, satellite imagery; Monte Carlo simulations; predictive analytics and spatial data mining; spatial data conflation, integration, fusion and multi-method approaches; spatial feature engineering; digital photography/imagery enhancement; spatial data quality and uncertainty with innovative approaches to data/information management.

**Spatial database** development and management: storage, access, transform, analyse, interpretation, and implementation for massive amounts of data (spatial ETL – e.g., Power BI, RapidMiner, MS Access, ArcGIS); documentation. Good experience in establishing or maintaining a database containing large data sets and a multi-dimensional array of data (OLAP cubes), which is particularly evident in the setting up of a web GIS server platform for the Cultural and Natural Heritage Database in Slovenia (2002-2006), and a Web GIS/Geostatistics portal for the Pomurje region, NE Slovenia (2012-2013), an Archaeological database of Central Dalmatia, Croatia (1994-1998); geospatial metadata bases for ZRC SAZU (2001-2013), UN spatial metadata base (UNGSC 2019, ESCWA 2021-2022); Database for digital elevation models processing (since 1998); Standard fundamental spatial data themes database from various sources for the Arab region (2022), and many others.

**Studies, based on various spatial databases:** geodetic **surveying** and mapping (total stations, levels, etc.) including satellite geodesy (GNSS) (since 1994); transformation of coordinate systems and map projection (since 1993); web design and development – now DNN, WordPress (since 1997); individual house design plans (since 1985); experience in working with AWS cloud-based servers (since 2017). Knowledge of design

and implementation of the internet of things (IoT), and video surveillance and protection technology (since 2014). Initiated an idea of a [COVID-19 spatial platform](#) in the UN and realized for MINUSMA on live **survey** data spatial dashboard (2020). Proposal and development of the statistical methods on **survey** data and research methodology for the project “Influence of daily individual meteorological parameters on the incidence of the acute coronary syndrome” (2018-2019). Contribution with a spatial approach to the ESCWA interdisciplinary project ‘Human development, poverty and multiple shocks in the Arab region – A geospatial analysis’ where I manipulate HDX, ACLED, DHS **survey** data, topographic data and highly pre-processed spatio-temporal data like as land cover (2022). From **survey** data in various countries (Croatia, Slovenia, Mexico, Albania, Austria) I modelled mental maps and maps from predictive models based on social and environmental variables (since 1994).

## Programming, architecture, algorithms, and application development

**Computer applications:** CAD and database management since 1990, GIS, cartography and RS since 1994, (spatial) statistics since 1996, Lidar since 2003, and various visualization software since 1994. Familiar with programming languages to bring research ideas beyond the limits of common off-the-shelf analytical software. Developing highly optimized code that takes into account spatial partitioning, parallel processing, memory utilization, CPU efficiency, and network demands.

**Programming coding:** Familiar with programming languages to bring developed algorithms beyond the limits of common off-the-shelf analytical software: (Visual) Basic, Fortran, C, C++, Python (including packages, libraries and APIs such as ArcPy, PyQGIS, PyGRASS, OpenCV, PySAL, GeoPandas/Matplotlib, Rasterio, Shapely, Fiona, NumPy, GDAL, QGIS, SAGA GIS), RPL using RPN (Reverse Polish Notation for HP), MATLAB and Octave, SQL, SQLite, Data Analysis Expressions (DAX), UML, LaTeX, HTML and JavaScript; programming with scripts for AutoCAD, ArcGIS [previously AML – ARC Macro Language] (including ArcGIS Pro, ArcInfo Workstation, FME Workbench, ArcGIS Server, ArcGIS Online, ArcGIS Enterprise portal, ArcSDE), open source GeoServer, eCognition, Google Earth Engine, Idrisi, ERDAS Imagine, Global Mapper, GRASS GIS, SAGA GIS, QGIS; for dashboards (Power BI, ArcGIS Dashboards); TensorFlow; spatial statistical programming in R (including ggplot2), Orange, SPSS; database programming in dBase, MS Access, MS Excel, PostGIS/PostgreSQL, SQLite; more creative programming scripts for visualization IrfanView, PaintShop Pro, CorelDRAW, Adobe CS now CC (in particular Adobe Acrobat, Photoshop, Illustrator, Bridge), and for video editors Adobe Premiere Pro and DaVinci Resolve, ImageMagick, FFmpeg etc. Microsoft Office 365, LibreOffice and Overleaf (LaTeX) skills.

**Operating systems:** MS Windows (CMD Shell, PowerShell), Linux (Bash), Unix (Unix Shell), Android.

## Fieldwork and research expeditions

Having contributed to several fieldwork projects own scientific outputs were improved during the process. The main areas of fieldwork are **ecological, archaeological, anthropological and geomorphological mapping**, based on my **geodetic survey**, including various land cadastre, **GNSS** and **lidar measurements**, and other **survey** and **geospatial data**. The archaeological fieldworks (1994–2005) lasted between one and eight weeks and included geodetic measurements, online mapping using innovative GIS-based quality control, design and creation of databases, archaeological prospection, etc., all of which served as a basis for further spatial analysis. Also, participated in fieldwork (archaeological reconnaissance, anthropological survey, geodetic surveying and advanced mapping, ecological and speleological investigations, etc.): in particular on the island Brač, in Makarska, and Cetina Valley in Croatia (1994 and 1999); at Tonovcov grad in Slovenia (1996); and in South Campeche, Yucatán, Mexico (2004 and 2005). Other experiences with fieldwork included GNSS (GPS) campaigns in Slovenia and (North) Macedonia (1994–1998), which usually lasted 10 days: EUREF’94, Slovenia’95, and EUREF MAK’96 to name a few. The other types of fieldwork included the measurement of trees’ position for lidar data calibration and making detailed relief measurements for lidar data control (2004), anthropological surveys in Albania (2007), mapping of invasive plants in Slovenia (*Fallopia japonica* and *Robinia pseudacacia*) (2009–2011), geomorphological survey (2014), and fieldwork for stabilization purposes in Mali (United Nations, 2020).

## Teaching Experience, Supervision

Solid **higher education teaching expertise** in the geoinformatics, geomatics, and GIScience. Allowed to **develop and deliver innovative and effective teaching lectures and curricula**, and learning materials, I attracted students and colleagues **from different disciplines to involve** GIS in the curricula of new disciplines. My well-designed and delivered lectures, tutorials and lab work enabled me to offer courses that are more dynamic, for digital terrain model production and applications; data quality and information; photogrammetry and cartography. Delivered GIS lectures for the Erasmus – Socrates Programme in 2006, as well as on Environmental Information Systems and GIS for undergraduate and postgraduate students at the University of Nova Gorica, Slovenia. Delivering lectures on Quality of Information for postgraduate students at the Faculty of Information Studies in Novo Mesto, Slovenia, and at the School of Advanced Social Studies in Nova Gorica, since 2008.

In addition to lecturing, teaching the **following subjects for individual postgraduates** in the GI and: spatial analysis, DEM/DTM, photogrammetry, cartography, geodesy, spatial data quality, landscape ecology, dialectology, landscape archaeology, habitats, and other environmental topics – at the University of Ljubljana, Slovenia (Faculty of Civil and Geodetic Engineering, Biotechnical Faculty and the Faculty of Arts), since 2008. **Responsible for setting the contents of all listed courses**, which have successfully passed accreditations at individual faculties and universities.

Supervised 2 Leonardo da Vinci Programme students and 4 young researchers, as well being as a regular informal mentor. A public examiner of 17 BSc, 1 MSc and 5 PhD theses.

## Significant Publications

Written, participated in, or actively contributed to more than **56 original scientific papers** for journals, 27 monographs, 54 popular science articles, 7 national, and 60 international conferences and meetings. A complete list of publications (currently 615 records) is documented in COBISS, [Personal Bibliographies](#). The representative publications are in chronological order (all references are available upon request):

- Palacios-Prado, N., Corominas-Sustach, F., Pérez, A.; Verdugo, D., **Podobnikar, T.** 2024: Encoded Landscapes: A Link between Inka Wall Orientations and Andean Geomorphology. *Land*, 13, 463. <https://doi.org/10.3390/land13040463>
- **Podobnikar, T.** 2023: ESCWA Spatial Data Infrastructure (SDI) Governance. *Standard Operating Procedure (SOP)*
- **UN-GGIM** 2021: Geospatial for Humanity: Prevention, Response and Recovery of the World from the Pandemic COVID-19, 44p. (appeared on pages 23-24 with my UN MINUSMA Mali [COVID-19 dashboard](#))
- Šarlah, N., **Podobnikar, T.**, Ambrožič, T., Mušič, B. 2020: Application of Kinematic GPR-TPS Model with High 3D Georeference Accuracy for Underground Utility Infrastructure Mapping: A Case Study from Urban Sites in Celje, Slovenia. *Remote Sens*, 12(8). DOI: [10.3390/rs12081228](https://doi.org/10.3390/rs12081228) (cited 17 times)
- Šarlah, N., **Podobnikar, T.**, Mongus, D., Ambrožič, T., Mušič, B. 2019: Kinematic GPR-TPS Model for Infrastructure Asset Identification with High 3D Georeference Accuracy Developed in a Real Urban Test Field. *Remote Sens*, 11(12). DOI: [10.3390/rs11121457](https://doi.org/10.3390/rs11121457) (highly accessed article in July and August 2019) (cited 12 times)
- **Podobnikar, T.**, Štefančič, M., Verbovšek, T. 2019: [A](#) GIS-based approach to karst relief cyclicity by using Fast Fourier transform. *AGILE 2019 – Limassol, June 17-20, 2019*, 5 p.
- **Podobnikar, T.** 2018: Palaeotopography concerning sea level changes to rethink past human activities in Central Dalmatian islands, Adriatic Sea. *Acta hydrotechnica*, 31(55), 143-156. DOI: [10.15292/acta.hydro.2018.09](https://doi.org/10.15292/acta.hydro.2018.09)
- Šturm, T., **Podobnikar, T.** 2017: A probability model for long-term forest fire occurrence in the karst forest management area of Slovenia. *Int J Wildland Fire*, 26(5), 399-412. DOI: [10.1071/WF15192](https://doi.org/10.1071/WF15192) (cited 14 times)
- **Podobnikar, T.**, Székely, B. 2015: Towards the automated geomorphometric extraction of talus slopes in Martian landscapes. *Planet Space Sci*, 105, 148-158. DOI: [10.1016/j.pss.2014.11.019](https://doi.org/10.1016/j.pss.2014.11.019) (cited 10 times)

- **Podobnikar, T.** 2012: Detecting Mountain Peaks and Delineating Their Shapes Using Digital Elevation Models, Remote Sensing and Geographic Information Systems Using Autometric Methodological Procedures. *Remote Sens*, 4(3), 784-809. DOI: [10.3390/rs4030784](https://doi.org/10.3390/rs4030784) (cited 44 times)
- **Podobnikar, T.** 2012: Multidirectional Visibility Index for Analytical Shading Enhancement. *Cartogr J*, 49(3), 195-207. DOI: [10.1179/1743277412Y.0000000012](https://doi.org/10.1179/1743277412Y.0000000012) (cited 16 times)
- **Podobnikar, T., Vrečko, A.** 2012: Digital Elevation Model from the Best Results of Different Filtering of a Lidar Point Cloud. *Trans GIS*, 16(5), 603-617. DOI: [10.1111/j.1467-9671.2012.01335.x](https://doi.org/10.1111/j.1467-9671.2012.01335.x) (cited 50 times)
- Dorigo, W., Lucieer, A., **Podobnikar, T.**, Čarni, A. 2012: Mapping invasive *Fallopia japonica* by combined spectral, spatial, and temporal analysis of digital orthophotos. *Int J Appl Earth Obs*, 19, 185-195. DOI: [10.1016/j.jag.2012.05.004](https://doi.org/10.1016/j.jag.2012.05.004) (cited 122 times)
- **Podobnikar, T.** 2009: Methods for visual quality assessment of a digital terrain model. *S.A.P.I.EN.S.*, special Issue 2(2), [15-24](#) (cited 121 times)
- **Podobnikar, T.** 2009: Georeferencing and quality assessment of Josephine survey maps for the mountainous region in the Triglav National Park. *Acta geod geophys Hung*, 44(1), 49-66. DOI: [10.1556/AGeod.44.2009.1.6](https://doi.org/10.1556/AGeod.44.2009.1.6) (cited 75 times)
- **Podobnikar, T.**, Schöner, M., Jansa, J., Pfeifer, N. 2009: Spatial analysis of anthropogenic impact on karst geomorphology (Slovenia). *Environ geol*, 58(2), 257-268. DOI: [10.1007/s00254-008-1607-3](https://doi.org/10.1007/s00254-008-1607-3) (cited 29 times)
- **Podobnikar, T.** 2005: Production of integrated digital terrain model from multiple datasets of different quality. *Int J Geogr Inf Sci*, 19(1), 69-89. DOI: [10.1080/13658810412331280130](https://doi.org/10.1080/13658810412331280130) (cited 95 times)

## Honours and Awards

Awarded with 25+ competitive grants including **Fulbright** and Skolkovo Innovation Center, as well as:

- Certificate of Outstanding Contribution in Reviewing of the ISPRS Journal of Photogrammetry and Remote Sensing, 2014
- Prešeren Prize for Students of the University of Ljubljana (as supervisor of Obu, J.), 2011
- Alumnus Optimus, Award for best student of School of Environmental Sciences, University of Nova Gorica (as supervisor of Jež, E.), 2010/2011
- Gisdata/Esri Award for exceptional students' results in the development and use of the geographical information systems (as supervisor of Obu, J.), 2010/2011
- First prize for the poster; Čeh, M., Smole, D., Podobnikar, T. Geodata: Are they accessible and usable?, 2004; 7th AGILE Conference on Geographic Information Science, Heraklion, Greece. The prize encouraged our team to pursue research on the topic of the universal ontology of geographic space. Proud to be asked to edit a monograph on the topic, which was published in 2012.

## Languages

**English:** fluent speaking, writing and reading

**Slovenian:** mother tongue

**Serbian and Croatian:** conversational

**German:** basic

**Italian:** basic

**Spanish:** basic

**Russian:** basic (I read Cyrillic)

**French:** basic

**Arabic:** basic