Curriculum Vitae et Studiorum

JOANNA MARIA PIECZYŃSKA-KOZŁOWSKA

Summary of Scientific and Professional Achievements

Dr Joanna Maria Pieczyńska-Kozłowska is a geotechnical engineer with over 15 years of academic and research experience, specialising in probabilistic modelling of soil behaviour and foundation reliability. Her principal research focus lies in the application and development of the Random Finite Element Method (RFEM), with particular emphasis on spatial variability and uncertainty quantification in geotechnical design.

She has authored ten peer-reviewed journal articles, including publications in high-impact international journals such as Computers and Geotechnics, Georisk, and Sensors, and has contributed extensively to international conference proceedings. Her work has received over 260 citations (Google Scholar), and she holds an H-index of 9, reflecting both the quality and relevance of her research contributions.

Dr Pieczyńska-Kozłowska has collaborated with leading figures in the field, including the original developers of RFEM, and has co-authored publications with international partners from Italy, Australia, and the United States. She has secured multiple research grants, including funding from the Polish National Science Centre and Wrocław University of Science and Technology, and has coordinated the Erasmus+ Mundus Joint Master Degree STRAINS programme since 2019.

Her academic service includes editorial management of the journal Studia Geotechnica et Mechanica, membership in national and international technical committees (e.g. ISSMGE TC205), and active participation in the organisation of international symposia. She has received several institutional awards, including the Bronze Medal for Long Service from the President of the Republic of Poland and multiple Rector's Awards for excellence in academic duties.

In addition to her research activities, she has supervised doctoral and master's students and delivered undergraduate and postgraduate courses in geotechnical engineering, probabilistic methods, and applied mathematics. Her professional experience also includes industry placements in geotechnical engineering firms and formal training in Horizon Europe project management.

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https://www.researchgate.net/profile/Joanna-Pieczynska-Kozlowska
Joanna M. Pieczyńska-Kozłowska | LinkedIn

Current position: 1/10/2015 - present **Assistant Professor**
Wrocław University of Science and Technology,
Faculty of Civil Engineering
Department of Geotechnology, Hydro Technology,
and Underground and Hydro Engineering

Previous positions:
22/09/2011 - 30/09/2015 **Assistant Academic Teacher**
Wrocław University of Science and Technology,
Faculty of Civil Engineering, Poland
Department of Geotechnology, Hydro Technology,
and Underground and Hydro Engineering

Education:

01/10/2007 - 28/06/2013 **PhD study in Civil Engineering**
Wrocław University of Science and Technology
Research topic: Losowa metoda elementów skończonych w analizie nośności posadowienia bezpośredniego | eng.: Application of Random Finite Element Method to bearing capacity design of strip foundation
Under supervision of Prof. dr hab. inż. Wojciech Puła

01/10/2002 - 30/09/2007 **MSc Eng study in Civil Engineering**
Wrocław University of Science and Technology
Specialty: Underground Structure and Urban Engineering
Research topic:

Research grants:

01/10/2018 - 30/09/2019 **Young Scientist grant program at Wrocław University of Science and Technology**
Research topic: Research on the structures cooperation of with soils modelled by random fields, (original title in Polish - Badanie nad współpracą konstrukcji z gruntem modelowanym polami losowymi)

01/10/2013 - 30/09/2014 **Young Scientist grant program at Wrocław University of Science and Technology**
Research topic: Research on the structures cooperation of with soils modelled by random fields, (original title in Polish - Badanie nad współpracą konstrukcji z gruntem modelowanym polami losowymi)

01/10/2012 - 30/09/2013 **Young Scientist grant program at Wrocław University of Science and Technology**
Research topic: Research on the structures cooperation of with soils modelled by random fields, (original title in Polish - Badanie nad współpracą konstrukcji z gruntem modelowanym polami losowymi)

01/03/2010 - 30/09/2013 **Supervision grant** supported by the Polish National Science Center (NCN) under the Grant No.: NN506 158338
Title: "Estimation of the bearing capacity of the shallow foundation using the random finite element method" (original title in Polish: Oszacowanie nośności fundamentu bezpośredniego za pomocą losowej metody elementów skończonych)

Publications in peer-reviewed scientific journals

These publications collectively advance the field of geotechnical engineering by addressing critical challenges related to soil spatial variability, foundation design, and the application of advanced probabilistic methods. By integrating random field theory and finite element methods, these studies contribute to more accurate, reliable, and safer geotechnical designs. Many of these works are openly accessible, ensuring that they contribute to both academic research and practical engineering applications on a global scale.

1. Yada Tesfaye Boru, Joanna Pieczyńska-Kozłowska, Wojciech Puła (2025) **Effects of Random Field Heterogeneity of Spatial Soil Properties on the Bearing Capacity of Neighbouring Footing**. International Journal for Numerical and Analytical Methods in Geomechanics 49.5 : 1408-1419, https://doi.org/10.1002/nag.3932

   This study investigates the bearing capacity of closely spaced strip footings on spatially variable cohesive–frictional (c-φ) soil using the Random Finite Element Method (RFEM). Soil properties, derived from field data on Taranto Blue Clay (Italy), are modelled as stationary random fields and integrated with finite element analysis. The research highlights how footing spacing and spatial correlation lengths influence bearing capacity and symmetry of failure patterns.
   As the corresponding author and lead content editor, I coordinated the publication process and ensured the scientific integrity, clarity, and consistency of the manuscript.

2. Joanna M. Pieczyńska-Kozłowska, Marcin Chwała, Wojciech Puła (2023): **Worst-case effect in bearing capacity of spread foundations considering safety factors and anisotropy in soil spatial variability**. Georisk

- Assessment and Management of Risk for Engineered Systems and Geohazards, s. 1-16, https://doi.org/10.1080/17499518.2022.2046786

By using the Random Finite Element Method to spread foundations bearing capacity analysis the study provides critical insights into the location of the worst-case phenomenon of spatial correlation parameters, which is closely related to the adopted safety factor. The genesis of work lies in the difficulties in directly indication the horizontal fluctuation scale (SOF) for which the failure probability has the greatest value. In this paper some general guidelines are formulated and proposed, applied to the two-dimensional bearing capacity problem.

3. Joanna M. Pieczyńska-Kozłowska, Giovanna Vessia (2021): **Spatially variable soils affecting geotechnical strip foundation design**. Journal of Rock Mechanics and Geotechnical Engineering, s.1-14, https://doi.org/10.1016/j.jrmge.2021.10.010 (open access)

The study focuses on calculating the bearing capacity of shallow foundations by RFEM in terms of undrained and drained conditions. The spatial variability structure of soil is characterized by the autocorrelation function and the SOF. The latter has been derived by geostatistical tools such as the Ordinary Kriging (OK) approach based on 182 CPTs performed in the alluvial plain in Bologna Province, Italy.

4. Joanna M. Pieczyńska-Kozłowska, Irena Bagińska, Marek Kawa (2021): **The identification of the uncertainty in soil strength parameters based on CPTu measurements and random fields**. Sensors. vol. 21, nr 16, art. 5393, s. 1-22, http://dx.doi.org/10.3390/s21165393 (open access)

The present paper responds to the challenge of modelling uncertainty in soil strength parameters concerning its spatial variability in a situation of limited soil information. The uncertainty is identified based on signals from the CPT device. Signals are directly transformed using two different interpretation methods to obtain depth-varying effective strength parameters of the soil. The process is performed by incorporating data from two case studies from different locations in similar soil materials. The comparison involves Keswick clay from Australia and Świerzna clay from Poland, for which CPT signals and laboratory tests were available. The study shows, how the variability of the transformed signals can be used to identify random fields describing soil strength parameters.

5. Joanna M. Pieczyńska-Kozłowska (2015): **Comparison between two methods for estimating the vertical scale of fluctuation for modeling random geotechnical problems**. Studia Geotechnica et Mechanica, vol. 37, nr 4, s. 95-103 http://dx.doi.org/10.1515/sgem-2015-0049 (open access)

This comparative study evaluates methods for estimating soil variability, aiding in the refinement of random geotechnical models. Two methods of obtaining SOF from the CPT measurements are presented. The first one is based on the method of Vanmarcke, using commonly in the geotechnical reliability-based design. The second one, the Rice method, is associated with wave signal theory. Both methods are applied to a case study in which the SOF are estimated.

6. Joanna M. Pieczyńska-Kozłowska, Wojciech Puła, D. V. Griffiths, G. A. Fenton (2015): **Influence of embedment, self-weight and anisotropy on bearing capacity reliability using the random finite element.** Computers and Geotechnics., vol. 67, s. 229-238; http://dx.doi.org/10.1016/j.compgeo.2015.02.013

The refinements in the work include the influence of embedment, soil self-weight and anisotropy which were not considered previously by the authors of the RFEM method – Griffiths and Fenton. The study focuses on a grey-blue clay from Taranto in Italy, for which stochastic strength parameters were well documented. Results show that the influences of embedment, self-weight and anisotropy can be significant and lead to more realistic estimates of bearing capacity reliability. Finally, a probability distribution of the bearing capacity was estimated and used to calibrate safety factors for reliability purposes. The paper shows the outcomes from my PhD thesis by expanding the authors' works on the bearing capacity of random soils using the RFEM.

7. Giovanna Vessia, Claudio Cherubini, Joanna Pieczyńska, Wojciech Puła (2009): **Application of random finite element method to bearing capacity design of strip footing** / Journal of GeoEngineering., vol. 4, nr 3, s.103- 112 http://140.118.105.174/jge/files/articlefiles/v4i320100122942866950.pdf (open access)

   This application-driven study demonstrates the utility of RFEM in foundation design. The paper in detail presents the calculation of statistical parameters for the Taranto Blue Clay from the south part of Italy. My role in the paper considered: preparation and formulation of geometry boundary conditions, numerical computation of batch analyses, and writing manuscripts for publication.

8. Joanna Pieczyńska, Wojciech Puła (2009): **Zastosowanie losowej metody elementów skończonych do analizy losowej zmienności nośności granicznej fundamentu bezpośredniego.** Górnictwo i Geoinżynieria, R. 33, z.1, s. 485-495

   This Polish-language paper was the first presentation of the analysis using RFEM by the authors, applying RFEM to evaluate the variability in the bearing capacity of direct foundations, further supporting geotechnical reliability studies.

Peer-reviewed conference proceedings

1. Yada Tesfaye Boru, Joanna Pieczyńska-Kozłowska, Wojciech Puła (2025) **Probabilistic Settlement Prediction for Neighbouring Footings at Different Spacing Distances in Rotated Spatial Anisotropic Multi-Layered Soil**. In: Proceedings of the 9th International Symposium for Geotechnical Safety and Risk (ISGSR 2025), 25– 28 August 2025, Oslo, Norway. Editors: Zhongqiang Liu, Jian Dai and Kate Robinson. DOI:10.3850/9789819440757

   The study proposes a probabilistic model for predicting settlement of neighboring footings in layered soils with rotated anisotropic spatial variability. Using RFEM and Monte Carlo simulations, it analyzes the influence of orientation angles and fluctuation scales of random fields on settlement behavior. Results reveal that rotated anisotropic properties significantly affect variability in settlement, while mean values remain stable.

2. Joanna M. Pieczyńska-Kozłowska, Giovanna Vessia (2019): **An application of the kriging technique to support the geotechnical designing of foundations based on CPTs in PO Plain alluvial deposits.** In: Proceedings of state-of-the-practice in geotechnical safety and risk: 7th International Symposium on Geotechnical Safety and Risk (ISGSR 2019), 11-13 December 2019, Taipei, Taiwan: proceedings s. 303-308. doi: 10.3850/978-981-11-2725-0_IS10-5-cd (open access)

   This study applies kriging techniques to improve the reliability of foundation design in alluvial deposits of PO Plain, enhancing data-driven decision-making in geotechnical engineering.

3. Joanna M. Pieczyńska-Kozłowska, Wojciech Puła, Giovanna Vessia (2017): **A collection of fluctuation scale values and autocorrelation functions of fine deposits in Emilia Romagna plain, Italy**. In: Geo-Risk 2017: impact of spatial variability, probabilistic site characterization, and geohazards, Denver, Colorado, June 4-7, 2017, Reston: American Society of Civil Engineers. s. 290-299. https://doi.org/10.1061/9780784480717.027

   By using the first 10m of seven CPTs from the Emilia Romania Plain, Italy has been performed analysis showing a difference in values of SOF obtained using different common auto-correlation functions(ACF). The SOF values and ACF lead to different estimations of the bearing capacity of shallow foundations using RFEM.

4. Wojciech Puła, Joanna M. Pieczyńska-Kozłowska, Marcin Chwała (2017): **Search for the worst case correlation length in the bearing capacity probability of failure analyses**. In: Geo-Risk 2017: reliability-based design and code developments, Denver, Colorado, June 4-7, 2017. Reston: American Society of Civil Engineers.[2017]. s. 534-544. https://doi.org/10.1061/9780784480700.051

   This research addresses the worst-case scenarios for horizontal SOF, improving safety issues in foundation design by analysing failure probability assessments. My role in the paper included: preparation and formulation of geometry boundary conditions, numerical computation of batch

analyses, writing manuscripts for publication, and evaluating, and visualising the results obtained from numerical analyses.

5. Wojciech Puła, Irena Bagińska, Marek Kawa, Joanna M. Pieczyńska-Kozłowska (2017): **Estimation of spatial variability of soil properties using CPTu results: a case study.** In: In situ and laboratory characterisation of OC subsoil: [6th International workshop, Poznań, Poland, June 26-27, 2017] Wydawnictwo Exemplum, s. 23-32. (available at ResearchGate)

   This case study demonstrates practical approaches to estimating soil spatial variability, providing valuable insights into soil characterization methods. My role in the paper included: the preparation and formulation of methods of estimating spatial variability presented in the paper, evaluating, and visualising the results obtained from numerical analyses, and writing manuscripts for publication.

6. Joanna Pieczyńska, Wojciech Puła (2013): **Evaluation of bearing capacity of shallow strip foundation using the random finite element method.** In: Computational Geomechanics: proceedings of the 3rd International Symposium on Computational Geomechanics (ComGeo III), Krakow, Poland, 21-23 August 2013 | IC2E International Centre for Computational Engineering, s. 472-483. (available at ResearchGate)

   This research contributes to the advancement of probabilistic geotechnical design by evaluating the bearing capacity of shallow foundations using RFEM.

7. Joanna Pieczyńska, Wojciech Puła, D. V. Griffiths, G. A. Fenton (2011): **Probabilistic characteristics of strip footing bearing capacity evaluated by random finite element method**. In: Applications of statistics and probability in civil engineering: proceedings of the 11th International Conference on Applications of Statistics and Probability in Civil Engineering, Zürich, Switzerland, 1-4 August 2011 / eds. M. H. Faber, J. Köhler, K. Nishijima. Leiden : CRC Press/Balkema, s. 1673-1682. 10.1201/b11332-249 (available at courses.engmath.dal.ca and ResearchGate)

   That is the first paper to present the results of the extended development of the RFEM method created by Griffiths and Fenton by adding the spatial correlation structure anisotropy in random field consideration. This paper provides a probabilistic analysis of footing-bearing capacity, furthering the application of RFEM in civil engineering.

All the presented papers are the core of the applicant's research interests, which since 2009 have been related to the Random Finite Element Method described by Griffiths and Fenton. Two papers from 2011 and 2015 together with the developers of the RFEM method confirm the commitment to the use of the application of advanced statistical and probabilistic methods to geotechnical engineering, specifically in the areas of foundation design, and spatial variability. These proceedings and studies improve the safety and reliability of geotechnical systems, particularly in challenging environments.

Research expeditions led by the researcher

03/07/2016 - 10/07/2016 **Erasmus+ visiting researcher**
Università degli Studi "G. d'Annunzio", Chieti-Pescara, Italy

Projects:

Since June 2019 Erasmus+ Mundus Joint Master Degree STRAINS grant (No.619582-EPP-1-2020-1-FR-EPPKA1-JMD-MOB). After successful application and funding from the European Commission, I have been coordinating the STRAINS program at my home university - Wroclaw University of Science and Technology (WUST). My tasks include (i) participation in the program and academic committee and ongoing support of incoming students at WUST; (ii) participation in the diploma exam commission; (iii) organizing the programs' events as workshops (2019, 2024) and summer school (2022). Beyond WUST, four universities around Europe are involved in the program: the University of Lille (France - Main Coordinator), the Catholic University Louvain (Belgium), the National University of Athens (Greece), and the University of Calabria (Italy).

2017 - 2019 Acquisition of grant No. 602/P-DUN/2017 for the journal Studia Geotechnica et Mechanica from the national funds of the Ministry of Science and Higher Education for science dissemination activities by raising the scientific level and degree of internationalization of published scientific journals and dissemination of information on the results of scientific research or development work. I served as Project Manager until I went on maternity leave.

Organisation of international conferences

1. Co-Chairman: Session IS22: "Reliability- and risk-based code developments II" (Richard J. Bathurst) at the 9th International Symposium for Geotechnical Safety and Risk (ISGSR), 24th - 27th August 2025, Oslo, Norway.

2. Organization / Co-Chairman: Session IS2 "Spatial variability assessment for engineering design and geohazard mapping" (Conveners: Giovanna Vessia, Wojciech Puła, Diego Di Curzio, Marcin Chwała, Joanna Pieczyńska-Kozłowska) at the 9th International Symposium for Geotechnical Safety and Risk (ISGSR), 24th - 27th August 2025, Oslo, Norway.

3. Organisation Committee Lider: Machine Learning & Risk Assessment in Geoengineering (MLRA2021) - Joint Symposium of Two Events: the 3rd International Symposium on Machine Learning in Geoscience (3ISMLG) & the TC304 Workshop on Risk Assessment in Geoengineering (TCWW), 25th -28th October 2021, Wrocław, Poland.

4. Winter School of Rock Mechanics and Geoengineering (ZSMGiG) - a periodic meeting since almost 50 years of its existence - is the integration of the scientific and research community with industry representatives, the creation of opportunities to update and deepen knowledge, and the presentation of current problems of rock mass mechanics and geoengineering.

    a. Organizing Committee Member in 44th ZSMGIG conference 20th - 23rd March 2023, Karpacz, Poland

    b. Organizing Committee Member in 42nd ZSMGIG conference 11th – 14th March 2019, Karpacz, Poland

    c. Organizing Committee Member in 40nd ZSMGIG conference 20th - 23rd March 2017, Karpacz, Poland

5. Organization and Chairmanship: Session SSS11.8 "Measuring and modelling spatial and temporal variability of soil properties and processes related to human activities" (Conveners: Giovanna Vessia, Joanna M. Pieczynska-Kozlowska, Ruth E Falconer, Ana Maria Tarquis, Klaudia Oleshko) at the EGU General Assembly 2014, 27 April – 02 May 2014, Vienna, Austria.

6. Organising Committee Member in EUROCK 2013 Rock Mechanics for Resources, Energy and Environment, October 23–26, 2013, Wroclaw, Poland

Membership in the steering and/or program committee

1. National member in the Technical Committee TC205 "Safety and Serviceability", International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE)
2. Member of Polish National Geotechnical Committee

Commissions of trust

1. Senator of the Wrocław University of Science and Technology for cadence 2024-2028
2. Member of Civil Engineering Faculty Academic Board since 2023, and for cadence 2024-2028, Faculty of Civil Engineering, Wrocław University of Science and Technology
3. Member of the Programme Board for the Advanced Solid Mechanics Master degree program since October 2020

Prizes and Awards

1. The President of the Republic of Poland awarded the Bronze Medal for Long Service in 2023 to recognize honourably completed 10 years of service to the Polish State as a civil servant.
2. Rector's Award of Wrocław University of Science and Technology for exceptionally conscientious performance of duties resulting from professional work in years: 2013, 2016, 2017, 2021, 2022, and 2023

Supervising and teaching activities at Wrocław University of Science and Technology

1. Co-supervisor of 1 PhD student
2. Co-supervisor of 2 MSc students
3. Co-supervisor of 11 BSc students
4. Teacher of courses on BSc level:
    a. Foundation Engineering Project
    b. Deep excavation Project
    c. Soil Mechanics Project and Laboratory
    d. Algebra and Analytics Geometry Lecture and Tutorial
5. Teacher of courses on MSc level:
    a. Select topics for geotechnical engineering project
    b. Probabilistic Methods in Engineering lecture, seminary, and tutorial
6. Diploma Examination Board Member of Advance Solid Mechanics program for MSc students

Other activities and experience

01/10/ 2021 – 30/09/2024	Promotion Coordinator at the Faculty of Civil Engineering
20/09/2023 - 23/11/2023	Participating in the Certificate Course in Management of Horizon EU Projects organized by the Polish National Contact Point.
2006 - 2009	Experience in geotechnical industries (Keller Polska, Terramost Polska) as an assistant engineer (when I was still study – till 2007) and as an engineer (when I finished my master's study)
since 2011	Editorial Manager in Studia Geotechnica et Mechanical Journal

Editorial activities

1. Reviewer for Georisk: Assessment and Management of Risk for Engineered Systems and Geohazards (ones in 2019, and 2020)
2. Reviewer for Studia Geotechnica et Mechanica (ones in 2019)
3. Reviewer for Biosystem Engineering (ones in 2017)
4. Reviewer for Measurements (ones in 2015)
5. Reviewer for Engineering Geology (in 2024)
6. Reviewer for Environmental Earth Sciences (in 2024)
7. Reviewer for International Journal for Numerical and Analytical Methods in Geomechanics (in 2025)

Bibliometric data

Last update August 2024	**SCOPUS**	**Web of Science**	**Google Scholar**
Peer-reviewed publications	10	10	10
Total citations	188	147	260
H-index	8	8	9