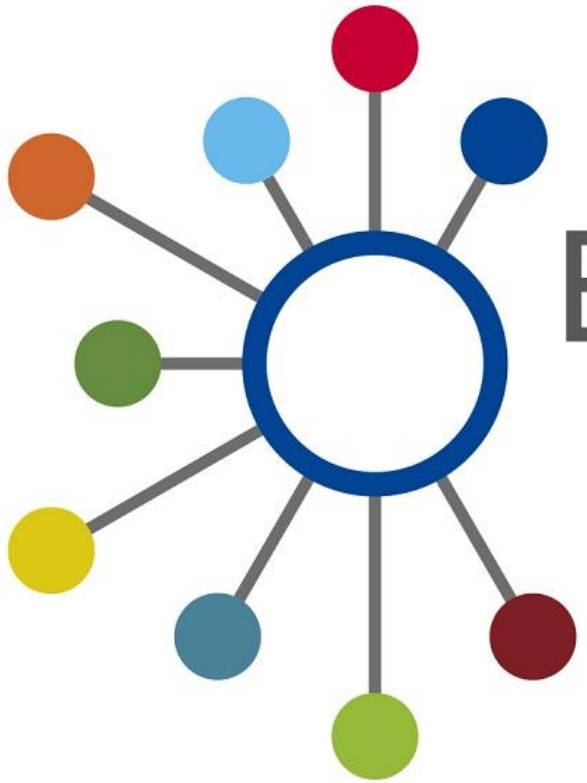


EUROPEAN MASTER IN OFFICIAL STATISTICS

EMOS

eurostat

Unlocking The Future of EMOS

some thoughts

Pedro Campos
Statistics Portugal & University of Porto

Structure

of the presentation

(more) Current & new ideas

1. Industry Collaboration / Project Development

2. Academic development and Knowledge Transfer

3. Skill Development for the Future Workforce.

Current & new ideas

- Content issues
  - learning outcomes and agencies needs

- Student Demand

- EMOS Governance

- The Future

Introduction

EUROPEAN MASTER IN OFFICIAL STATISTICS
EMOS

- The main objective of EMOS is to strengthen students' ability to understand and analyse European official data in various aspects, including data quality, production processes, dissemination and analysis, in national, European and international contexts.

→ Statistical Thinking, Quantitative Core, Data Literacy, Initial Dispositions

↓ **Data Scientist**

Garfield & Gal, I. (1999), Gal (2002), Nicholson et al, (2019), Pratesi and Campos (2021), etc.

Eurostat, Learning Outcomes of the EMOS programmes, 2019, https://cros.ec.europa.eu/system/files/2023-12/EMOS%20Learning%20Outcomes%202019.pdf

EUROPEAN MASTER IN OFFICIAL STATISTICS EMOS

MODERN DATA SCIENTIST

Data Scientist, the sexiest job of the 21th century, requires a mixture of multidisciplinary skills ranging from an intersection of mathematics, statistics, computer science, communication and business. Finding a data scientist is hard. Finding people who understand who a data scientist is, is equally hard. So here is a little cheat sheet on who the modern data scientist really is.

MATH & STATISTICS

- Machine learning
- Statistical modeling
- Experiment design
- Bayesian inference
- Supervised learning: decision trees, random forests, logistic regression
- Unsupervised learning: clustering, dimensionality reduction
- Optimization: gradient descent and variants

PROGRAMMING & DATABASE

- Computer science fundamentals
- Scripting language e.g. Python
- Statistical computing packages, e.g., R
- Databases: SQL and NoSQL
- Relational algebra
- Parallel databases and parallel query processing
- MapReduce concepts
- Hadoop and Hive/Pig
- Custom reducers
- Experience with xaaS like AWS

DOMAIN KNOWLEDGE & SOFT SKILLS

- Passionate about the business
- Curious about data
- Influence without authority
- Hacker mindset
- Problem solver
- Strategic, proactive, creative, innovative and collaborative

COMMUNICATION & VISUALIZATION

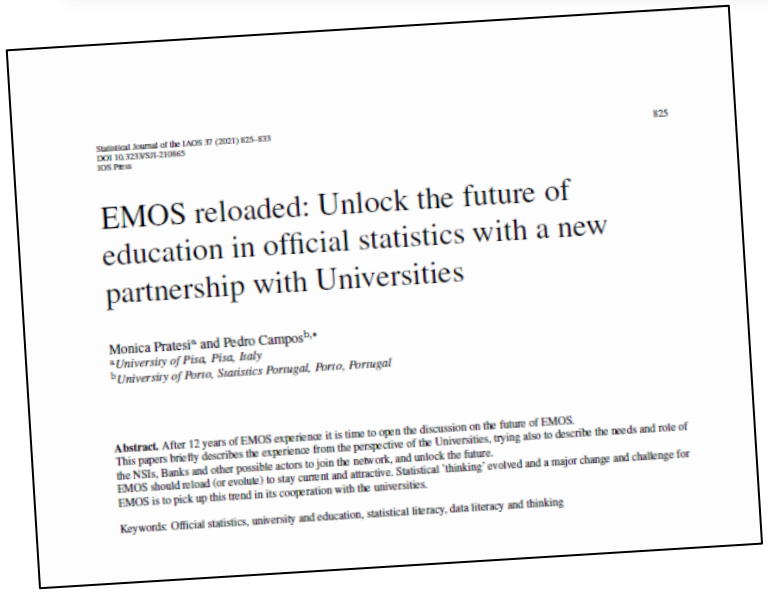
- Able to engage with senior management
- Story telling skills
- Translate data-driven insights into decisions and actions
- Visual art design
- R packages like ggplot or lattice
- Knowledge of any of visualization tools e.g. Flare, D3.js, Tableau

MarketingDistillery.com is a group of practitioners in the area of e-commerce marketing. Our fields of expertise include: marketing strategy and optimization: customer tracking and on-site analytics: predictive analytics and econometrics: data warehousing and big data systems: marketing channel insights in Paid Search, SEO, Social, CRM and brand.

Marketing DISTILLERY

Introduction

- My sources



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Statistical Journal of the IAOS 37 (2021) 825–833
DOI 10.3233/SJI-210865
IOS Press

EMOS reloaded: Unlock the future of education in official statistics with a new partnership with Universities

Monica Pratesi[a] and Pedro Campos[b,*]
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[b]University of Porto, Statistics Portugal, Porto, Portugal

Abstract. After 12 years of EMOS experience it is time to open the discussion on the future of EMOS. This papers briefly describes the experience from the perspective of the Universities, trying also to describe the needs and role of the NSIs, Banks and other possible actors to join the network, and unlock the future. EMOS should reload (or evolute) to stay current and attractive. Statistical 'thinking' evolved and a major change and challenge for EMOS is to pick up this trend in its cooperation with the universities.

Keywords: Official statistics, university and education, statistical literacy, data literacy and thinking

EMOS reloaded: Unlock the future of education in official statistics with a newpartnership with Universities
(Monica Pratesi and Pedro Campos, 2021)

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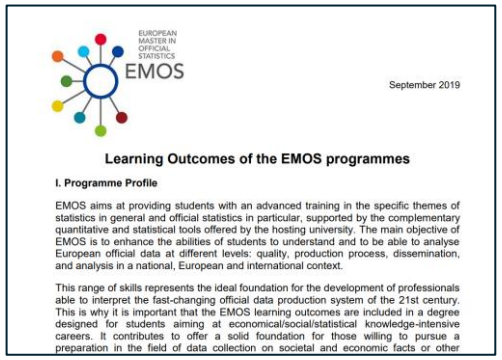


EUROPEAN MASTER IN OFFICIAL STATISTICS
EMOS

September 2019

Learning Outcomes of the EMOS programmes

I. Programme Profile

EMOS aims at providing students with an advanced training in the specific themes of statistics in general and official statistics in particular, supported by the complementary quantitative and statistical tools offered by the hosting university. The main objective of EMOS is to enhance the abilities of students to understand and to be able to analyse European official data at different levels: quality, production process, dissemination, and analysis in a national, European and international context.

This range of skills represents the ideal foundation for the development of professionals able to interpret the fast-changing official data production system of the 21st century. This is why it is important that the EMOS learning outcomes are included in a degree designed for students aiming at economical/social/statistical knowledge-intensive careers. It contributes to offer a solid foundation for those willing to pursue a preparation in the field of data collection on societal and economic facts or other

Learning Outcomes of the EMOS programmes, 2019

+

PPMi

Study on the future development of the European Master in Official Statistics

Final Report 9 February 2024

Study on the future development of the European Master in Official Statistics
Final Report, Eurostat, 2024

+ Current trends… and thoughts

Content issues

EMOS and current important **learning outcomes**

1. Systems of official statistics

   To be aware of the importance of official statistics as information infrastructure for the society and of its principles;

2. Production models and methods

   To be aware of different production models, including the business and enterprise architecture concepts applied to official statistics

3. Specific themes

   To be able to understand methodological issues related to other fields of official statistics and to interpret correctly official statistics in these and in evolving fields e.g. economy and finance, population and social conditions, industry, trade and services, agriculture and fisheries, international trade, transport, environment and energy, science and technology, general and regional statistics, sustainable development goals

Source: Eurostat, Learning Outcomes of the EMOS programmes, 2019, https://cros.ec.europa.eu/system/files/2023-12/EMOS%20Learning%20Outcomes%202019.pdf

Content issues

EMOS and current important **learning outcomes**

4. Statistical methods

Sampling methods, small area estimation, non-response adjustments, editing and imputation, treatment of big data, time series analyses, index theory, multivariate statistics, econometrics, spatial statistics, knowing the concepts of metadata and paradata, data integration, critical capacity of framing analysis of statistical data;

Confidentiality issues and user experience in programming capacities (eg SAS, R, SPSS or STATA)

(this latter have also been reinforced in the Final Report, Eurostat, 2024)

5. Dissemination

Ability to present data in an effective way to different kinds and present results, such as tables, charts in a static and dynamic web-based environment, data warehouses, and advanced visual graphics…

Source: Eurostat, Learning Outcomes of the EMOS programmes, 2019, https://cros.ec.europa.eu/system/files/2023-12/EMOS%20Learning%20Outcomes%202019.pdf

Content issues

EMOS and the statistical agencies' **needs** (Pratesi and Campos, 2021)

- Administrative sources
- Big Data, Smart Statistics, Machine Learning
- Statistical Confidentiality
- Social Issues

Content issues

- Putting it all together… and doing the matching

Matching between the required EMOS learning outcomes, and the current important topics

Current important topics EMOS learning outcomes	Administrative data	Big data/smart statistics	Privacy and confidentiality	New statistics
1. System of official statistics	√	√		√
2. Production model and methods	√	√		√
3. Specific themes				√
4. Statistical methods	√	√	√	√
5. Dissemination	√	√		√

Source: Pratesi and Campos (2021)

EMOS report

Content issues

Student Demand

EMOS Governance

The Future

Student demand

Main challenges

limited visibility

untapped international potential

difficulty attracting students and retaining graduates in the public sector

Source: Study on the future development of the European Master in Official Statistics, Final Report, Eurostat, 2024

Student demand
Possible solutions

MAKING THE REQUIREMENTS FOR THE OFFICIAL STATISTICS CURRICULUM MORE FLEXIBLE COULD HELP EXPAND THE EMOS NETWORK TO A WIDER RANGE OF PROGRAMMES AND HIGHER EDUCATION INSTITUTIONS, AND FOSTER INTERDISCIPLINARITY. ALLOW PART-TIME INTERNSHIPS

INCREASE THE NUMBER OF JOINT PROGRAMS. SEE BDMA: MA IN BIG DATA MANAGEMENT AND ANALYTICS (ERASMUS MUNDUS JOINT MASTER DEGREE)

MDATAGOV - A JOINT (HYBRID AND ONLINE) INITIATIVE BETWEEN THE OFFICE FOR NATIONAL STATISTICS (ONS) DATA SCIENCE CAMPUS AND FOUR UNIVERSITIES ACROSS THE UK, AVAILABLE TO ALL PUBLIC SECTOR EMPLOYEES

Source: Study on the future development of the European Master in Official Statistics, Final Report, Eurostat, 2024

Student demand
Possible solutions (cont.)

The network could find synergies with and benefit from several recent EU initiatives, namely the Erasmus Mundus Joint Master Degrees, Marie Skłodowska Curie Doctoral Networks, the European Universities initiative and the upcoming European Degree (label).

Good iniciatives: EMOS workshops, European Big Data Hackathon, or the Master's Thesis Competition

(my suggestion: involve companies and employers?) There is one challenge in the report: Forming strategic alliances with big data producers;

Source: Study on the future development of the European Master in Official Statistics, Final Report, Eurostat, 2024

Student demand
Possible solutions (cont.)

Allow/Increase delivery of EMOS at bachelor's or doctoral levels,

setting up an EMOS alumni network.

Expanding the network of internship hosts beyond NSIs and ESS

Creating more opportunities for coordinated short- and long-term student mobility within the EMOS network, including cross-borders internships

Establishing and internship/fellowship/junior work programme for recent EMOS graduates

Source: Study on the future development of the European Master in Official Statistics, Final Report, Eurostat, 2024

EMOS Governance
Main Challenges

- workload
- too much "local"

- Source: Study on the future development of the European Master in Official Statistics, Final Report, Eurostat, 2024

EMOS Governance Possible Solutions

structuring the board into thematic working groups that could involve other network members as thematic experts

some administrative tasks could be delegated to external experts when necessary. setting up an EMOS student council

(my suggestion: involve companies and employers, as well?)

Source: Study on the future development of the European Master in Official Statistics, Final Report, Eurostat, 2024

EMOS Governance

Possible Solutions (Cont.)

Knowledge transfer

Creating shared learning and teaching resources on official statistics, leveraging online and hybrid models

Allow EMOS to have a designated visiting professorship or a similar staff mobility scheme to encourage mobility among academic staff and beyond the current regional network hubs. A visiting professorship scheme would also foster academic and research collaboration in official statistics.

...for example, based on a collaboration between universities (eg: the problem in Berlin)

Source: Study on the future development of the European Master in Official Statistics, Final Report, Eurostat, 2024

Future

- EMOS as a Quality label
- EMOS as a joint program
- EMOS as a certificate

Source: Study on the future development of the European Master in Official Statistics, Final Report, Eurostat, 2024

EMOS Future 2.0 (!)

Address the challenges of EMOS regarding the current needs of producing official statistics and exploit the potential of the programmes to unlock the future and reload EMOS, mainly in three big areas:

1. Industry Collaboration & Project Development
2. Academic development and Knowledge Transfer
3. Skill Development for the Future Workforce.

1. Industry Collaboration & Real-World Application

Partnerships with companies: Focus on the role of industry partnerships in shaping curricula and providing practical experience. By collaborating with companies, academic programs can stay aligned with the latest industry trends and needs.

EMOS report: Governance

Projects with real data: Connect theory to practice. Real-world data projects help students not only understand data science techniques but also experience the complexities and challenges of working with live data, often under industry-relevant constraints.

Learning Outcome 4

Data Labs: data science students can engage in hands-on projects, often in collaboration with industry partners, to work on large-scale datasets and tackle real business or societal challenges.

Learning Outcome 4

2. Academic Excellence & Knowledge Transfer

Exchange of Teachers:

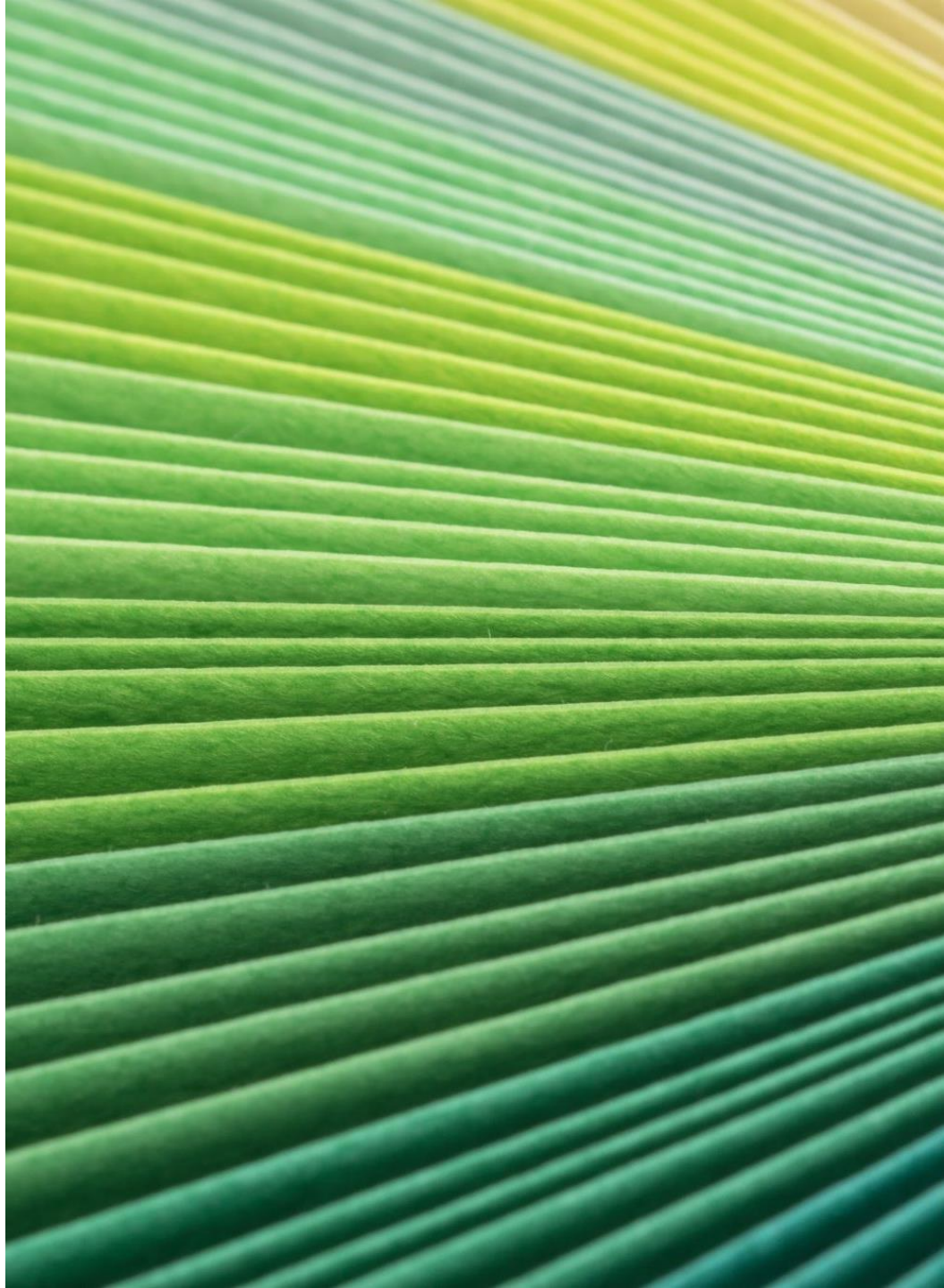
cross-pollination of teaching styles, research, and knowledge between institutions, both locally and globally. by exchanging teachers, institutions can improve the quality of instruction and encourage a more diverse academic approach.

EMOS report: Governance

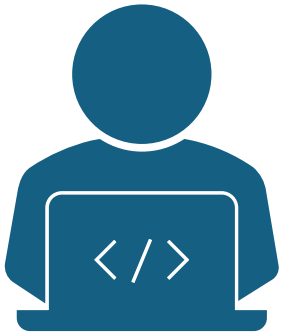
Topics of AI:

include the theoretical foundation and cutting-edge research topics in ai, machine learning, natural language processing, or ai ethics, which are crucial to the future of data science and technology.

Learning Outcome 4



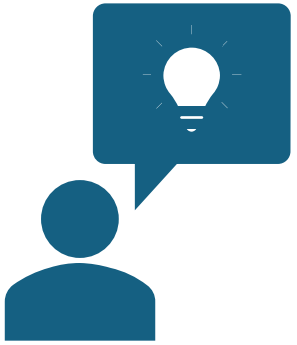
3. Skill Development for the Future Workforce



Programming:

Technical skills, particularly in programming, are the backbone of data science. Emphasizing programming languages such as Python, R, or SQL is essential for building a robust skill set in this field.

Learning Outcome 4



Visualization and Communication Skills:

The ability to present complex data insights clearly and persuasively is essential in any data-driven role. This includes storytelling with data, creating effective visualizations, and communicating findings to stakeholders who may not have a technical background.

Learning Outcome 5

Matching the structure

	1. Industry Collaboration & Project Development	2. Academic development and Knowledge Transfer	3. Skill Development for the Future Workforce.
• Content issues	✓		✓
• Student Demand	✓		✓
• EMOS Governance		✓	

A Cluster Analysis of the programmes

Methodology:

- Source data: web pages of the EMOS Master programmes
- A rank of some features has been created
- Cluster analysis (Hierarchical cluster with Ward aggregation method)

A Cluster Analysis of the programmes

Variables considered in the Analysis (in a scale 1:10)

Partnerships

Projects with real data

Data Labs

Topics of AI/ML

Programming

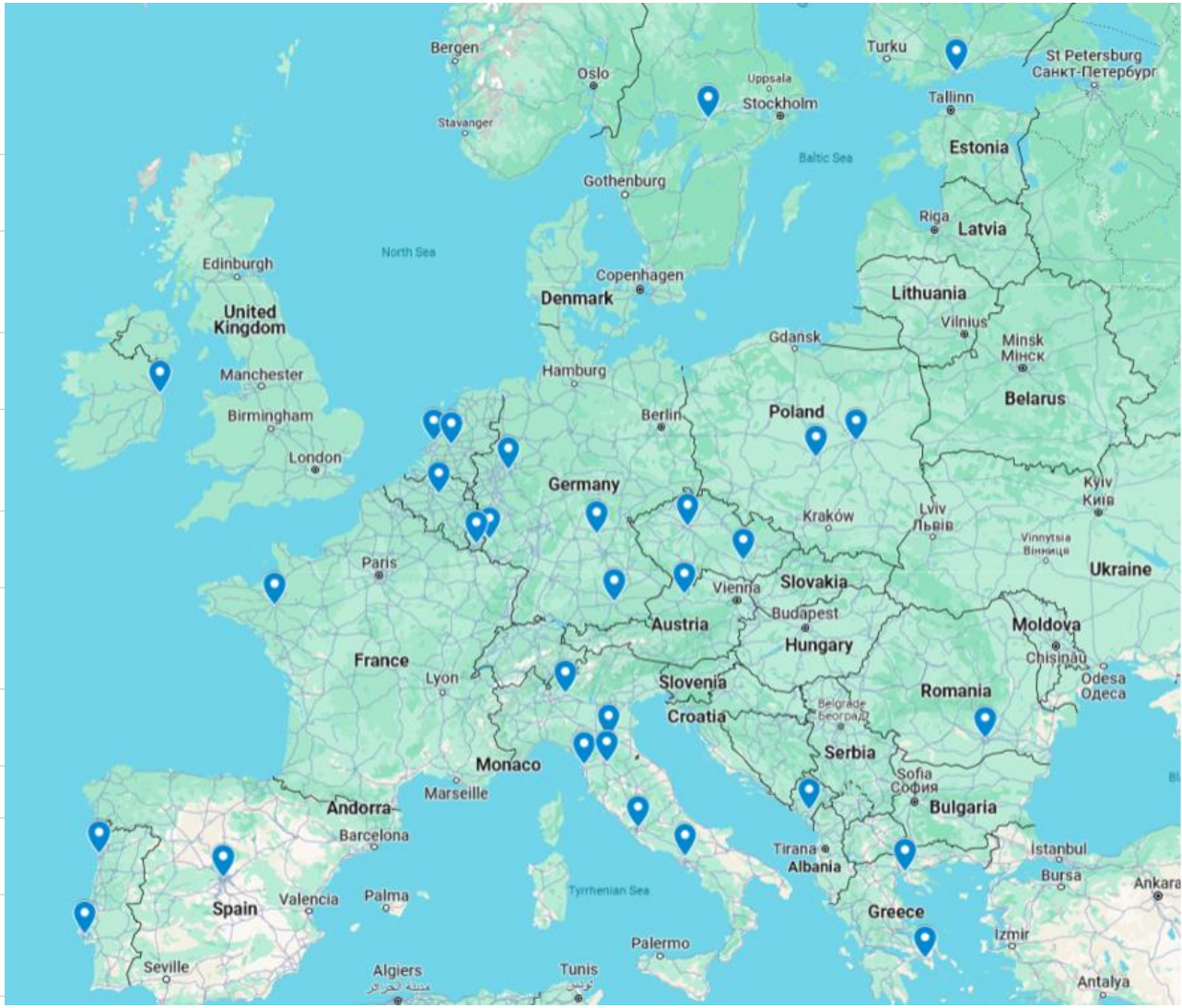
Visualization and Communication skills

Source: web pages of the EMOS Master programmes

Partnerships with companies couldn't be easily assessed
Teacher Exchange couldn't be assessed at all

Current programmes

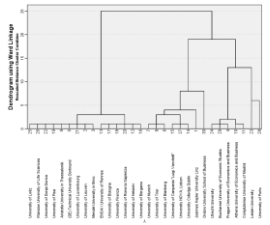
Johannes Kepler University Linz	KU Leuven	Mendel University in Brno
Prague University of Economics and Business	Technical University Dortmund	University of Bamberg
University of Munich	University of Trier	Aristotle University in Thessaloniki
Athens University of Economics and Business	Complutense University of Madrid	University of Helsinki
ENSAI / University of Rennes	University College Dublin	University of Bergamo
University of Bologna	University of Campania 'Luigi Vanvitelli'	University of Firenze
University of Pisa	University of Rome La Sapienza	University of Luxembourg
University of Donja Gorica	Leiden University	Utrecht University
University of Lodz	Warsaw University of Life Sciences	University NOVA, Lisbon
University of Porto	Bucharest University of Economic Studies	Orebro University School of Business



A Cluster Analysis of the programmes

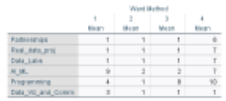
2 1 3 4

4 clusters



Results: 4 clusters

Cluster 1: programmes includes strong content in AI/Machine Learning, and Data Visualization Tools; some skills in programming



Cluster 2: programmes with some AI/ML but don't mention other features

Cluster 3: programmes with some AI/ML contents but very high programming skills

Cluster 4: programs containing partnerships, use real data projects and data labs. High programming skills, but low Viz and Comm skills.

Results (cont.)

What we couldn't find (or couldn't find much of)

- Partnerships with companies
- Real data projects
- Data labs
- Data Visualization and communication

- *Partnerships with companies couldn’t be easily assessed*
- *Teacher Exchange couldn’t be assessed at all*

Main take aways

Invest on:

- **Industry Collaboration and Project Development**
  - By collaborating with companies, academic programs can stay aligned with the latest industry trends and needs.
- **Academic development and Knowledge Transfer**
  - Allow EMOS to have a designated visiting professorship or a similar staff mobility scheme to encourage mobility among academic staff and beyond the current regional network hubs. A visiting professorship scheme would also foster academic and research collaboration in official statistics
- **Skill Development for the Future Workforce**
  - AI/ML, programming, and data visualization and communication skills are crucial

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