## Seminar Applied Business Analytics Overview

Prof. Dr. Philipp Baumann

University of Bern

Fall 2023 (tentative, as of August 16, 2023)

## Outline





- 2 Business case 2023
- 3 Deliverables

Prof. Dr. Philipp Baumann, Fall 2023 Seminar Applied Business Analytics

Lecturer Contact General information Syllabus

## Outline



- Lecturer
- Contact
- General information
- Syllabus

#### 2 Business case 2023

#### 3 Deliverables

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## CV Philipp Baumann

*u*<sup>b</sup>

- Born in Bern
- 2009: MSc in Business Administration, University of Bern
- 2013: PhD in Business Administration, University of Bern
- 2013–14: Research Scholar at IEOR Department, UC Berkeley
- 2014–15: Postdoc at IEOR Department, UC Berkeley
- 2015–18: Assistant Professor in Quantitative Methods/Operations Research, University of Bern
- Since 2018: Associate Professor in Quantitative Methods/Operations Research, University of Bern
- Research:
  - Machine learning/Data mining
  - Mathematical programming in finance and operations

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## Contact

- Department of Business Administration
- Chair in Quantitative Methods
- Engehaldenstr. 4, 3012 Bern, office 209
- E-Mail: philipp.baumann@unibe.ch
- Website: http://www.pqm.unibe.ch





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### Seminar in context of master studies

- 6 ECTS
- Registration required for participation
- Required knowledge: completion of Bachelor degree in Business Administration or Economics
  - Introduction to Mathematics
  - Introduction to Statistics
  - Basic Python skills (from recommended courses below)
  - Free online course that covers required Python skills: www.coursera.org/learn/python-data-analysis
- Recommended courses:
  - Big Data Analytics (Master)
  - Portfolio Optimization (Master)
  - Business Analytics (Bachelor)

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#### Learning outcome of seminar

#### Learning outcome

- The students are able to
  - model a decision situation as a machine learning (ML) problem
  - clean, prepare, and visualize the relevant data
  - develop a specific ML-system for the decision situation
  - present their algorithms and results in a written report



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# Grading



- 35% Implementation of learning system (group grade)
  - Correctness and reproducibility
  - Degree of innovation (e.g., feature engineering)
  - Readability of code
  - Independence
  - Performance of learning system (indirectly)
- 30% Discussion of learning system (individual grades)
- 35% Written report (group grade)
  - Structure
  - Content
  - Example to illustrate algorithm
  - Style (includes orthography and grammar)
  - Format (according to guidelines)

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## Syllabus (tentative)



- 18.09. 2:15pm-6:00pm: Introduction, distribution of algorithms, Python I (room 105, Engehaldenstr. 8)
- 25.09. 2:15pm-4:00pm: Optional LaTeX introduction (TBD)
- 02.10. 2:15pm-6:00pm: Python II (room 105, Engehaldenstr. 8)
- 02.10. Deadline for registration via KSL
- 23.10. Interim code review
- 03.11. Submission of Jupyter Notebook via email to philipp.baumann@unibe.ch
- 06.11. 2:15pm-4:00pm: Guidelines report (room 105, Engehaldenstr. 8)
- 10.11. 9:00am–11:00am: Discussion of Jupyter Notebook (room 105, Engehaldenstr. 8)
- 04.12. Submission of printed report in room 209, Engehaldenstr. 4

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## Timeline







#### Outline





#### 2 Business case 2023

3 Deliverables

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#### Business case 2023



# Predicting Airbnb prices in New York

Prof. Dr. Philipp Baumann, Fall 2023

Seminar Applied Business Analytics

Slide O12

#### Business case 2023: data



- 15,000 Airbnb listings of New York (Source: Inside Airbnb)
- 66 features per listing
  - Location
  - Room type
  - Number of beds
  - Link to website of listing
- Prices per night for listings in training set



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#### Business case 2023: decision situation

- Objective: predict the price per night based on features
- Benefit for host: can take better pricing decisions
- Benefit for guests: can identify fairly priced listings
- Given:
  - Training set: features and price of 12,000 listings
  - Test set: features of 3,000 listings
- Sought: price of 3,000 listings in test set
- Performance measure: mean absolute error

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#### Business case 2023: algorithms

Available machine learning algorithms

- AdaBoost
- Extremely randomized trees
- Gradient boosting
- Histogram-based gradient boosting
- Neural network models
- Random forests

Each group of students works with one of these algorithms

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Learning system Report

## Outline



#### 1 Organization

- 2 Business case 2023
- 3 Deliverables
  - Learning system
  - Report

Learning system Report

#### Learning system

- Software: Python
- Editor: Juypter Notebook
- Content:
  - Data analysis
  - Feature engineering
  - Model building
  - Model evaluation



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Learning system Report

#### Report



- Software: LaTeX
- Length: 10 to 15 pages
- Content:
  - Decision situation
  - Machine learning algorithm (based on an example that is related to the business case)
  - Feature engineering and data preparation
  - Experimental design
  - Results