CEMLA
CENTER FOR LATIN AMERICAN MONETARY STUDIES

DEUTSCHE BUNDESBANK
EUROSYSTEM

III COURSE ON MACHINE LEARNING AND CENTRAL BANKING

Digital Format
September 12 - 15, 2022

MONDAY
12
SEPTEMBER
2022
Mexico City time (UTC -5)

Moderator: Gerardo Hernández-del-Valle, *CEMLA*
Speakers: Gabriela Alves Werb and Sebastian Seltmann, *Deutsche Bundesbank*

09:00 – 09:20 **Welcome remarks**

Gerardo Hernández-del-Valle, In charge of the Directorate of Financial Markets Infrastructure, *CEMLA*

09:20 – 10:30 **Introduction I**

- Structure and Organization of the Course
- Train, Test and Validation Samples
- Cross-Validation

10:30 – 10:45 **Break**

10:45 – 12:15 **Introduction II**

- Confusion Matrix
- Evaluation Measures (Precision, Recall, F1-Score, etc.)
- PR Curve

TUESDAY
13
SEPTEMBER
2022
Mexico City time (UTC -5)

Moderator: Gerardo Hernández-del-Valle, *CEMLA*
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08:30 – 09:00 **Q&A**

09:00 – 10:30 **Tree-Based Methods**

- Decision Trees (CART)
- Conditional Inference Trees

10:30 – 10:45 **Break**

10:45 – 12:15 **Introduction to Ensemble Methods**

- Bagging
- Boosting

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WEDNESDAY
14
SEPTEMBER
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08:30 – 09:00 **Q&A**

09:00 – 10:30 **Ensemble Methods I**

- Random Forest
- Causal Random Forest

10:30 – 10:45 **Break**

10:45 – 12:15 **Ensemble Methods II**

- Gradient Boosting

THURSDAY
15
SEPTEMBER
2022

Mexico City time (UTC -5)

Moderator: Gerardo Hernández-del-Valle, *CEMLA*
Speakers: Gabriela Alves Werb and Sebastian Seltmann, *Deutsche Bundesbank*

08:30 – 09:00 **Q&A**

09:00 – 10:30 **Support Vector Machines**

- Support Vector Machines

10:30 – 10:45 **Break**

10:45 – 12:00 **Machine Learning Use Cases in Central Banking**

- Showcase of Current Applications
- Open Discussion with Participants

12:00 – 12:15 **Wrap-Up**

Gabriela Alves Werb and Sebastian Seltmann, *Deutsche Bundesbank*

12:15 – 12:30 **Closing Remarks**

Gerardo Hernández-del-Valle, *CEMLA*

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OPTIONAL READINGS

For a comprehensive introduction to R, we recommend participants to take the online tutorial "Introduction to R" from Datacamp.

- Athey, S. (2017), "Beyond prediction: Using Big Data for Policy Problems", Science, 355, 483–485.
- Bali, R., Dipanjan, S., Brett, L. (2016), "R: Unleash Machine Learning Techniques", Birmingham, UK, Packt Publishing
- Breiman, L. (2001), "Statistical Modeling: The Two Cultures Source", Statistical Science, 16(3), 199-215.
- Hastie, T., Tibshirani, R. & Friedman, J. (2009), "The Elements of Statistical Learning. Data Mining, Inference, and Prediction", New York, Springer.
- James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013), "An Introduction to Statistical Learning: with Applications in R", New York, Springer.
- Shmueli, G. (2010), "To Explain or to Predict?", Statistical Science, 25(3), 289–310