Bayesian computation: State of the art and recent developments

Research Seminar in Selected Topics in Statistical Learning and Data Science

Prof. Dr. Nadja Klein and Guillermo Briseño Sanchez | Summer term 2025

Organisation of the seminar: ILIAS

- The seminar is organised by Prof. Dr. Nadja Klein and Guillermo Briseño Sanchez.

- There will be an ILIAS page used for topic allocation, literature, templates, upload of material, etc. You will be notified via forum in ILIAS.

- In exceptional cases, you may send Guillermo Briseño Sanchez an email: guillermo.briseno-sanchez@kit.edu.

Note: The registration of the seminar is binding!

Tasks for the students

The participants of the seminar are expected to:

1. give an oral presentation about one specific method,

2. implement said method,

3. prepare a handout (max. 2 DIN A4 pages), hand in slides with transcript two weeks before presenting, and

4. attend an in-person meeting for feedback and consulting (CS 20.20).

The presentation

- Each student presents one specific topic of Bayesian computation.

- Explain the method and illustrate it through at least one example.

- Prepare slides using the mandatory LaTeX KIT template available here:
  https://sdq.kastel.kit.edu/wiki/Dokumentvorlagen.

- 20 minutes presentation + 10 minutes for discussion.

- Recommendation: Focus on the main ideas of the method.

The implementation

- Either implement the method yourself from scratch or use publicly available packages.

- Please use R or Python.

- Use either simulated data or real data for your example (or both).

- If you rely on publicly available packages make sure that your example is somewhat interesting.

Examples:

- Not very interesting: Applying Stan to estimate the mean of a simulated Gaussian random sample.

- More interesting: Applying Stan to analyse complex real data.

The handout

- Provides a brief summary of the topic (max. TWO DIN A4 pages).

- The handout must be submitted together with your slides, a transcript of your slides, and your code, i.e. preliminary version of the material, to Guillermo Briseño Sanchez two weeks before your presentation.

- You will receive feedback on your submitted material shortly after. Please modify your material accordingly for final submission.

- Upload your final version of the material to ILIAS (at least 24 hours prior to your presentation).

Important dates and requirements

- Requirements: passed lecture ABDA with at least 3.7 grade or equivalent.

- Registration via ILIAS: Open from March 1 2025 to March 14 2025. You will be notified via forum in ILIAS.

- Send certificate of passed ABDA or equivalent to Guillermo Briseño Sanchez via mail and no later than March 14 2025. It will be checked and your participation either approved or rejected.

- The registration of the seminar is binding, once approved.

- Assignment of topics: March 16 2025.

- Introductory session (Tentative): 03.04.2025.

Presentation dates (Tentative):
- Thursday June 12 2025, from 11:30–13:00. CS 20.20 Room 267.

- Thursday June 26 2025, from 11:30–13:00. CS 20.20 Room 267.

- Thursday July 3 2025, from 11:30–13:00. CS 20.20 Room 267.

Evaluation

- The seminar will be graded based on the preliminary as well as final versions of your material: Your presentation, its transcript, your code and your handout.

- Important criteria: Correctness of the presentation, code and handout. Time management (20 mins), formal appearance of the material.

Personal meeting:

- Each student must meet once with Guillermo Briseño Sanchez (30 mins) before submitting the preliminary material.

- Each student will be asked two questions related to their assigned topic.

- The students should arrange a meeting via email. Preferably Thursdays from 11:30–13:00.

- The personal meeting is mandatory. Preliminary material submitted without attending the personal meeting will not be considered.

Nadja Klein and Guillermo Briseño Sanchez: Research Seminar in Selected Topics in Statistical Learning and Data Science Methods for Big Data, Scientific Computing Center

Evaluation

The last possible day for a personal meeting is on

- May 22 (for students presenting on June 12).

- June 5 (for students presenting on June 26).

- June 19 (for students presenting on July 3).

Note: If you opt for a meeting on any of these dates it means that you will have only one week to implement any changes to your material!

Literature

The main references for the seminar are:

1. Gael M. Martin, David T. Frazier, Christian P. Robert. (2024) "Computing Bayes: From Then 'Til Now," Statistical Science, 39(1), 3-19. `https://doi.org/10.1214/22-STS876`.

2. Gael M. Martin, David T. Frazier, Christian P. Robert. (2024) "Approximating Bayes in the 21st Century," Statistical Science, 39(1), 20-45. `https://doi.org/10.1214/22-STS875`.

Further literature will be provided via ILIAS.