Computation infrastructure for teaching Bayesian modeling

JSM 2020

bit.ly/JSM2020_Sta444

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Context

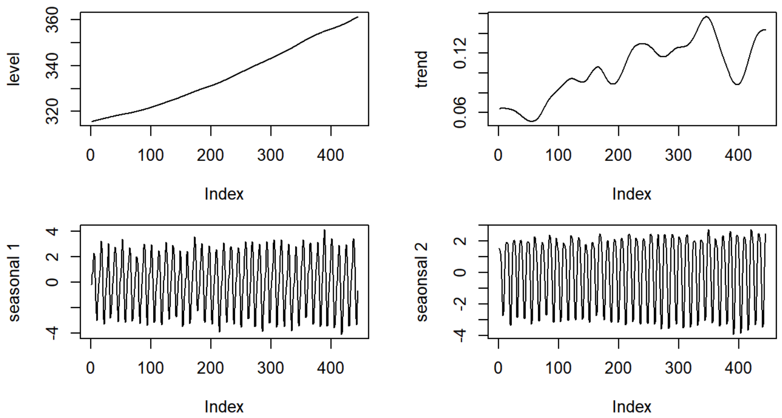
Sta 444 / 644 - Spatiotemporal Modeling

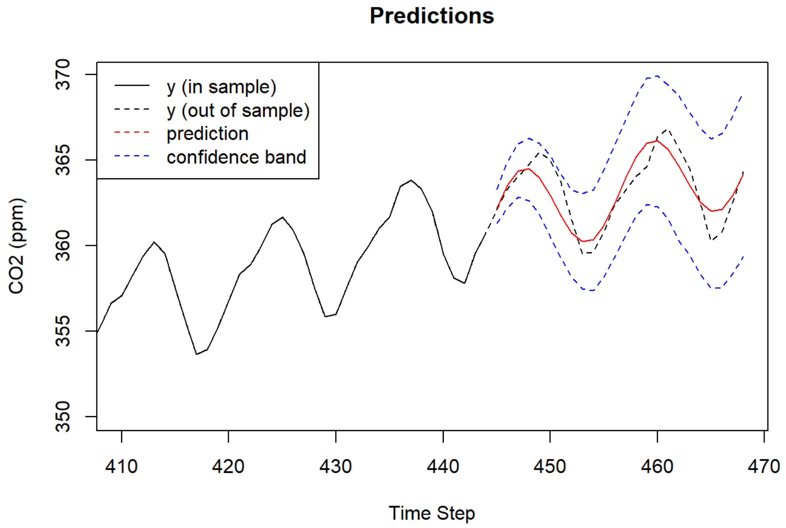
- 4th year undergraduate elective (2nd year MS elective)
- *Prereq* Sta 360 - Bayesian Inference and Modern Statistical Methods
- Weekly labs / problem sessions with TA
- 5 hws + 1 group project over the semester
  (mathematical, computational, and applied problems)

Learning Outcomes

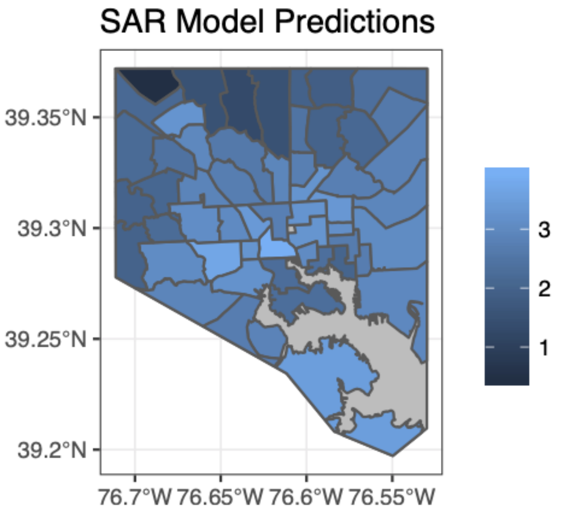
- Modeling methods (lm, glm, ARIMA, GPs, CAR, etc.)
- Model assessment and validation
- Bayesian model implementation (probabilistic programming)

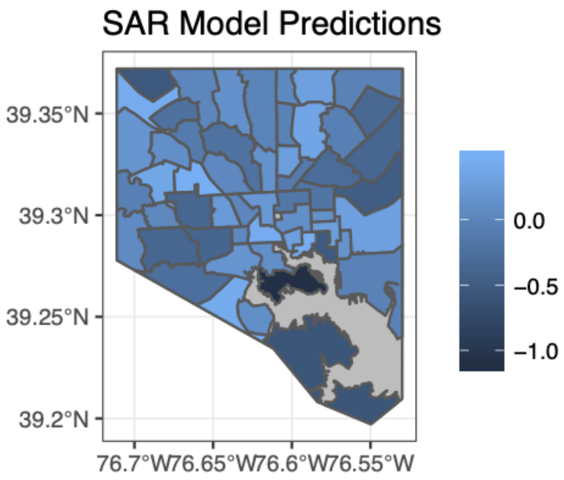
DLM for predicting CO_2





Violent Crime in Baltimore City





Software

- Wide varierty of choices: BUGS, Jags, Stan, etc.
- Some considerations:
  - Generalizability vs. specificity
  - Syntactic complexity
  - Performance
  - Limitations

Computational Complexity and Efficiency

This is often the first course where students engaged with models that cannot be fit "instantly".

- Basics of algorithmic complexity
- Model limitations vs software limitations
- Implementation vs run time

Infrastructure

The platform provided for students matter (labs vs. servers vs. student laptops):

- Configuration / Administration

- Performance

- Workflows

Thank you!

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