September 9, 2024 Theory Working Group Call

Attendees: Jim Junker, Bilgecan Sen, Cole Brookson, Freya Olsson, Jody Peters, Caleb Robbins, Jon Borrelli, Shubhi Sharma

Agenda:

1. Check in with Cole, Abby, Shubhi, and Caleb about working group proposal for [ESIIL](#) - would be great to have a form of funding to get some dedicated time and space for the group together to work on the ongoing projects the working group has been discussing for the past 1-2 years following the methods papers (the Forecast Challenge synthesis and the
   a. There is ~$32,500 available for in-person meetings
   b. RFP: 2024 WG Docs to Download
   c. Focus of RFP is on big questions about environmental data science.
   d. Provides funds for in-person meetings over 2 years
   e. Subgroup has been meeting to figure out topics for proposal application and figure out potential participants (n=15)
   f. Ecological and environmental predictability from theoretical and applied stand points using the NEON Forecasting Challenge data
      i. Push our understanding about predictability forward on the theoretical and applied
      ii. Would like to have a component focused on education around predictability. How do we teach people about predictability? Connect it to information theory
      iii. Review about the concepts of predictability that we know so far.
         1. Since it is a new discipline the terminology is changing (e.g., forecast horizon)
         2. In climate science think there are already a lot of concepts that would be useful
         3. Connect this review to the education
         4. Since ecoforecasting is interdisciplinary, this working group would allows us to pull in people from philosophy of science, math, ecology, etc
   g. The in-person meeting would still stay for connected with the Theory working group. The 15 participants is not an exclusive group - it will continue to connect with the Theory group that meets monthly virtually
   h. The proposal ideas will be shared with the EFI Steering Committee on the October call to run the ideas by SC and explore funding options in addition/in place of the ESIIL funding
   i. There are RCN funds available to support travel for an in person meeting and the Conference in May 2025 has Thursday set aside for working group to get together - the group should continue to keep this in mind
   j. The subgroup welcomes input from the broader group.

      i.   Goal - work out a tentative group to meet by next week

k. Goal at start would be to write the synthesis piece - gets everyone on the same page on what is the state of knowledge

      i.   Is there a timeline necessary for the synthesis?

           1. Does the challenge submissions need the theoretical underpinnings to do the forecast challenge synthesis analyses?

     ii.   One paper bringing together the differing perspectives which could also be the culmination fo the synthesis fo the challenge analyses.

l. So far have been working in tandem with the theoretical/applied analyses. But consider if there will be one of the components that will suffer without doing the other component first. Or if it is fine to do the work in tandem.

      i.   This mapping out will be important for the proposal and to lay out the roadmap for the group

m. Quantifiable synthesis option - this is what we see the intrinsic predictability is and this is how well the forecasts predictions did with the realized predictability

      i.   Quantify what is missing from the models.

     ii.   Models need to think about this aspect since we see the untapped potential of predictability

n. Thinking that the theoretical and applied components would be the starting point but then expect that other research questions will come up.

o. During the meeting - have time set aside for subgroups for both topics to get together to make progress then come together and share updates and get input

p. Timeline

      i.   First meeting: Idea generation, project planning, decide what future tasks are needed and how to structure monthly Theory working group calls

     ii.   There is a virtual meeting included with the ESIIL which can give the group a chance to bring together people outside the 15 for dedicated working time

q. The proposal is due in November - so what to do for October and November calls?

      i.   Could use the time to brainstorm the synthesis to jump start those ideas

     ii.   For the next meeting - pick a paper on predictability to discuss

           1. Bilgecan will pick a paper that we can send to the group in the next 2 weeks

           2. Use the discussions to push us towards a synthesis paper

           3. Paper Freya shared: The intrinsic predictability of ecological time series and its potential to guide forecasting

                a. https://esajournals.onlinelibrary.wiley.com/doi/10.1002/ecm.1359

           4. Paper Abby shared: https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/eap.1589

           5. What is predictable about predictability

                a. Some predictions are better for some things

        b. Abby's example: Is a model doing better because it represents the ecosystem better or is it better because we can forecast the drivers better for one model vs another model

        c. Predictive vs causal inference

2. Caleb - Using the NEON Forecasting Challenge to explore predictability across variables and scales
   a. GitHub Repo: https://github.com/robbinscalebj/NeonPredictability/issues
   b. Chlorophyll forecast status
   c. Update about connection with Steve Munch and EDM models
   d. Update about progress on managing large data file storage in the forecast workflow and GitHub actions

3. Cole and Shubhi - simulations, weighted permutation entropy and handling data gaps.
   a. Using simulations and NEON data - can we pull info from time series using weighted permutation entropy and realized permutation entropy - use it to look at how predictable the time series are
   b. 2 things -
      i. Simulate from models and permutation entropy
      ii. Looking at the NEON data
   c. How does data gaps affect understanding of predictability

4. Marcus - machine learning forecasts and NEON Forecasting Challenge.

5. Blog post idea for code review materials (Jody)
   a. On January call the group talked about Jody drafting the blog post and running it by the group. There is no definite timeline for this, but hopefully within the next month or two
      i. SORTEE group has a lot of energy between code review and seems like there is overlap with EFI
      ii. SORTEE: https://www.sortee.org/
      iii. Has Slack channel - here is the link to join
      iv. Library of code mistakes:
         1. Can add anonymously issues that people have found when their code has been reviewed
         2. E.g., day/time errors, misunderstanding of function
         3. It is structured with the same headings that were in the paper on code review