

March 22, 2021 Theory Working Group Call

Attendees: Christy Rollinson, Abby Lewis, Lisa Haber, Jody Peters, Mike Dietze

Regrets: Amanda Gallinat

Agenda:

1. Draft Outline of Theory group manuscript and Next Steps - follow up with Abby about conversation on February's call about what she thinks will work best for writing
 - a. Previous version
 - b. Game plan. Abby taking writings and orals in April, so won't be able to contribute until done with those.
 - c. Idea moving forward is to divide section of the current skeleton and flesh out still in outline form. Two options, have people write out individual paragraphs or section or have one person lead the writing to keep it in the same voice
 - d. The body of the manuscript is organized around 2 questions
 - i. Q1: How does predictability relate to spatiotemporal variability
 1. Have a couple of hypothesis figures. 2 components to factors that limit predictability (inverse of predictability)
 - a. Stochastic processes - make long term prediction hard
 - b. Parameter and process variability also make long term prediction hard
 - ii. Q2: When does a thorough understanding of processes in one context imply that this understanding will transfer to another context?
 1. Questions 35, 36, 64 (and many more) - from Sutherland's 100 Fundamentals Questions of Ecology
 2. Goal was to have hypotheses for all questions posed about questions in transferability. This may not be feasible given the length of the paper. We have discussed some ideas, but whoever takes leadership on this section will have more thinking to do (see point g below).
 - iii. Add a section about forecasting as hypothesis testing
 1. Could be a good section to lead into talking about forecasting. Or to use as a wrap up to show why this all matters and is powerful. There is a section in the Intro that connects to this so can connect back to it in the Discussion as well.
 2. Mike - lead with this argument. Convince people that forecasts are a useful way of testing theory. Forecasting is an expression of scientific method and then say here are some of the questions that forecasting will allow us to answer.
 3. Forecasting can be used to approach any question in ecology. Use predictions to make ideas more quantitative.
 4. Then the transferability questions are more synthesis. There are certain questions we can answer only by comparing across many different forecasts.

5. Hypothesis testing is for any application of ecology
- iv. Conclusion - road map for increased use of near-term forecasting
- v. Example: Eric Ward - compared forecasting models of vertebrate abundance - from that analysis could see which species are more predictable over 1-5 year horizons. Great example of the synthetic work
- vi. Could also point to high level macroecology patterns. Then get into what is the new unique thing we get from a synthesis of forecasts. For example, there are syntheses from COMPADRE and COMMADRE - but the challenge is you only have the final database. So you lose a lot of sources of uncertainty that we think is important for making comparisons
- vii. Moving forward - want the community to embrace an overarching framework that will allow for comparison and
 1. Just archiving single best estimate for single best model is not going to be sufficient to answer comparative questions about predictability
- e. Want to make this a concise, exciting paper that is not in the weeds
 - i. Clearly articulating what is new is very important
- f. What is new?
 - i. People have been using forecasting to test hypotheses for 40 years (see papers from 1980s-1990s).
 - ii. What is different now?
 1. Uncertainty and uncertainty quantification
 2. Fewer paper thinking about overarching questions about predictability and transferability.
 - a. Have Mikes' 2017 paper, Petchey Paper, Peter Adler's paper
 - b. But not a depth of literature on asking questions about predictability.
 - c. But will need to do due diligence to look for other literature thinking about the same thing in other contexts
 - d. Thinking about different sources of uncertainty could get into the weeds and differences of vocabulary. E.g., Mike's 5 sources of uncertainty vs Carl's approach from epistemological perspective. This is a debate to be aware of.
 - i. Point to emphasize - we are trying to not go into the weeds. Trying to connect people like Mike and Carl. Not be purely theoretical and not go into the weeds of how you do forecasts
- g. Had been thinking to have hypotheses, but won't address each of them. Is there an approach to address them that could be added?
 - i. Outline hypotheses that several years down the road we would have the quantity of forecasts to assess those hypotheses.
 - ii. Hesitant to include hypotheses that we don't answer.

- iii. But think reviewers and readers would be okay with it, if set up in the beginning that it is the goal to lay out the overarching questions that synthetic questions in forecasting could answer. And lay out the path forward on how to do these synthesis
- iv. Key - we are at the question level. We are not at the “we predict X” stage. We are at the stage where we can lay out the key questions.
- v. And we can include statements like - “based on our current understanding, the majority of co-authors would predict X, but it is an open question.”
- vi. And it would also be interesting to have places where we say “Here are the places where the authors disagree on what they expect.”
- vii. Looking at the conceptual figure (green/red figure in the outline - moving forward will change the green/red coloring to be color-blind friendly) - this provides a good example of a hypothesis that the group can point to.
- h. How to write the paper? Do we want to be clear it is coming from EFI?
 - i. No advantage to avoiding the reality that we are the EFI Theory group.
 - ii. Good to state something like this in the acknowledgements statement: “This work is part of the EFI Theory Working Group”
 - iii. Worth pointing out that these questions are actively being worked on through efforts such as the EFI RCN NEON Forecast Challenge and the Forecasting Standards since not everyone in EFI would be aware of that
 - iv. However, even though we will be able to address some of the questions brought up in this paper with a synthesis of the results from the 5 themes of the RCN NEON Challenge, it won’t be enough, we need to have more forecasts in standards that are able to go into a comparative synthesis to really be able to make broad statements.
 - v. Could frame it as the next generation of meta-analyses
 1. To be able to compare, the forecasts need to be done in a similar manner/similar structure in order to get at these hypotheses
 2. Cite the Standards Document so don’t have to get too far into the weeds about the details of the Standards
 3. The working group working on the Standards had been planning to wait and see how it goes with the Challenge and if any concrete issues (not just the issues of people not putting column headings in the correct format) come up as people use the Standards. But the Standards group is also thinking of archiving a pre-print sooner rather than later
 - a. If this Theory paper makes enough progress that having the Standards as a pre-print is needed, then Mike/Jody can coordinate pushing that pre-print.
 - vi. Broader conceptual point - intro vs conclusion that connects with the issues found in the Standards
 1. One of the challenges with getting the Standards to be used is to figure out what are the actual problems and what are the technical

problems (e.g., getting people to follow directions). Continual balance found in this type of work

- i. Next steps for the manuscript
 - i. Have people sign up for a paragraph or a section of the document. Take ownership of that part of the paper. Include references
 - ii. There is a skeleton outline - but adding what is important in each section will be helpful.
 - iii. Next month - talk through the draft outline and continue to add to it during the group call. Then move towards putting together rough draft text after that meeting
 - iv. Send out a recap request. Then nudge people with specific emails in the community that have been participating. Then have back clean up people (e.g., Mike).
 1. Amanda Gallinat, John Foster, Alex Young, Jonathan Tonkin, Glenda Wardle, Nick Record, Hassan Moustahfid, Jaime Ashander, Dan McGlenn, Peter Adler
 2. For students that want to be involved. Help to build annotated bibliography.
 - v. Ask for input the week before the meeting to have a week for Abby to synthesize (push this off for the May call since Abby will be prepping for her orals the week of our April call)
 - vi. Organization-wide co-authorship policy. Would be good to put a matrix in the document that lists the way you can contribute and how many Xs are needed.
 1. Hesitate to have anything too strict. Abby has some draft co-authorship agreement from previous activities
 - vii. Get people assigned to sections and brainstorm and come ready to discuss and identify where there are still gaps and then we can think about who to nudge.
 - viii. Spend this month dividing up tasks. Everybody think about your section.
 - ix. Abby will add a matrix for co-authors discussion next month.