

September 28, 2021 Theory Working Group Call

Attendees: Christa Torrens, Cole Brookson, Amanda Gallinat, Glenda Wardle, Elyssa Collins, Abby Lewis, Mike Dietze, Jody Peters, Jaime Ashander

Agenda:

1. Abstract was submitted - any follow up needed for that?
2. Table 1 that compares forecasting with other modeling approaches.
3. Toy Model updates
4. Manuscript outline
5. The following are the notes from the discussion from the Sept 28 Call: Manuscript framing - around 2 points.
 - a. Forecasting to understand predictability.
 - b. Forecast transferability related to uncertainty in a couple of ways
 - c. Goal is to identify what is it about ecological theory that we want to do and we can't and how does forecasting allow us to address that gap. Restructured the abstract and outline to get at this.
 - i. Rapidly ravine hypotheses with iterative testing
 - ii. Predict ecological dynamics
 - d. Audience - forecasting techniques fit an important need in ecological theory
 - e. Want to pitch this to an audience that is not a forecasting audience in particular, but are an ecology audience
 - f. Want to be direct about how predictability and transferability are linked.
 - g. Point 3 of abstract discussion:
 - h. Goal is to think about concepts and theory and not think about it in terms of methods. Don't get bogged down in "here is a stats method on how to do this". Don't want this to be a methods paper
 - i. Forecasting going beyond the methods - it is a way of thinking about how you are doing your science. The value to theory is in the reframing. Lots of people have thought about transferability, but what are the new things we can think about as a discipline that can help us move forward when we think about it from a forecasting perspective.
 - i. From Mike's 2018 Partitioning uncertainties paper experience - thinking about uncertainties as providing unifying framework that allow for apples to apples comparison across ecology/any system was a really exciting realization.
 - ii. Comparative analysis aspect is important for this paper
 - j. Can we take ideas from point 1 and focus in point 3 and in the outline?
 - i. Iterative testing doesn't happen for all forecasts
 - k. What drew Glenda to forecasting is getting at fundamentals of ecological theory. Nothing is new but the cycles and timeliness. Pendulum of thought - is theory in fashion or out and what is the influence of funders. Why aren't we comfortable to own theory in our discipline?
 - i. Theory is important for the beginning of project.

- ii. Seeking generality is the transferability
 - iii. Prediction is skill of matching empirical to the ideas
 - iv. How much do we want it to be stimulating to the discipline?
 - v. Forecasting can be for more people is another message
 - l. Highlight how forecasting centers theory in ecological research. Don't focus on the method, but what the method allows us to do.
6. Priorities for rewriting
- a. Get "comparative" in the abstract.
 - b. Glenda's dichotomy needs to get in the abstract
 - c. What makes ecological systems predictable. What is predictable in nature.
 - d. If we are case study ecologists, then we stop caring about the overall picture of what each case study tells as a whole.
 - e. Put prediction front and center. Don't have to do theory separate from problem solving. Bring forecasts together to do something novel
 - f. There is an argument that the sum of the parts is more predictable than the individual parts
 - g. Are people talking about transferability? Disease ecology and invasive species research are both thinking about transferability, but the ecologists in those disciplines don't necessarily think across the systems to see the similarities
 - i. Comment from Jaime
 - h. Don't want to miss out on the point that there is transferability across systems. Want all ecologists to see themselves in this paper.
 - i. Tension between forecasting as methodological approach and a philosophical decision
 - j. Data science and transferability - comes up with deep learning/machine learning. Transfer knowledge from one model to another. Training data and test data do not need to come from the same source. If we come back to transferability - then we may want to draw on this and show how transferability will help with machine learning.
 - k. Where is forecasting an essential part in comparative analysis and when do we not need forecasting to do that.
 - i. Need to test whether you are right or not. If you have a great model but can't make predictions to validate if we are right or not.
 - ii. Forecasting forces us to hold out data
 - iii. Forecast performance - Abbies plot of chl, phto, pollen, et - what her plot shows is something you would not be able to examine if you don't have forecasts. This is exactly what Mike wants people to be doing.
 - l. Predictability question is intuitive that you need to have forecasts. But then that leads to transferability
 - m. Updated framing - if we go broader, go more exciting and more theoretical. Gaps that can be addressed - there is a need for a unified framework for comparison. Focus on forecast as unified framework. Being able to compare across forecast and what can be learned across forecasts. Need to focus on prediction and use prediction to link analysis and practice. What good is a model if we can't make

predictions (there may be some cases where this is true, but in a lot of cases we want to make predictions). Then go into a section on generating prediction and forecasting can link theory and practice.

- i. Specific notes from Amanda on this updated framing:
 - ii. 1) Importance of forecasting as a unified framework: comparisons across forecasts, what can we learn across disciplines by building a community of forecasts/forecasters? e.g. scale of predictability! segue- in most cases, models are only valuable if they give us a forecast (it is beneficial if we can test it on novel data - or can there be nuance added here?)... (2) focus on prediction, and allow us to link analysis and practice
 - n. If we don't find the things that are not predictable we won't know how well we can make forecasts
 - o. In first section - we can't understand the broad scale limits of predictability unless we are able to compare forecasts across disciplines so we can see where we reach the limits. One forecast can't tell us this. Make sure the limits of what is predictable and what is not predictable highlighted in this section.
7. Next steps: Want to start getting more words on the page. Next deadline will be getting the outline submitted.