UNDERSTANDING AND PREDICTION pdf

1: Understanding and Predicting Technological Innovation: Big Data and New Theory Course

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Previously Masters student at Cambridge, Engineering student in Ghent. I like connecting the dots. LIME explaines of model predictions at the data sample level. It allows end-users to interpret these predictions and take actions based on them. Source Why is it necessary to understand interpretability methods? If you trust a technique with explaining the predictions of your model, it is important to understand the underlying mechanics of that technique, and any potential pitfalls associated with it. Interpretability techniques are not fault proof, and without a good understanding of the method, you are very likely to base your assumptions on falsehoods. Feature importance is often used to determine which features play an important role in the model predictions. A decision or random forest consists of multiple decision trees. Source The authors investigated two random Forest RF implementations and the standard measures of feature importance they provide. I highly recommend to read their blog post for a thorough understanding of the findings. The technique attempts to understand the model by perturbing the input of data samples and understanding how the predictions change. Model-specific approaches aim to understand the black model machine learning model by analysing the internal components and how they interact. In deep learning models, it is e. LIME provides local model interpretability. LIME modifies a single data sample by tweaking the feature values and observes the resulting impact on the output. Often, this is also related to what humans are interested in when observing the output of a model. The most common question is probably: Other model interpretability techniques only answer the question above from the perspective of the entire dataset. It allows you to verify hypotheses and whether the model is overfitting to noise, but it is hard to diagnose specific model predictions. Examples of interpretable representations are e. The output of LIME is a list of explanations, reflecting the contribution of each feature to the prediction of a data sample. This provides local interpretability, and it also allows to determine which feature changes will have most impact on the prediction. An example of LIME applied to a classic classification problem. Source An explanation is created by approximating the underlying model locally by an interpretable one. Interpretable models are e. The interpretable models are trained on small perturbations of the original instance and should only provide a good local approximation. By only approximating the black-box locally in the neighborhood of the data sample the task is significantly simplified. Potential pitfalls Although the general idea of LIME sounds easy, there are a couple of potential drawbacks. In the current implementation, only linear models are used to approximate local behaviour. To a certain extent, this assumption is correct when looking at a very small region around the data sample. By expanding this region however, it is possible that a linear model might not be powerful enough to explain the behavior of the original model. Non-linearity at local regions happens for those datasets that require complex, non-interpretable models. Secondly, the type of modifications that need to be performed on the data to get proper explanations are typically use case specific. The authors gave the following example in their paper: For example, a model that predicts sepia-toned images to be retro cannot be explained by presence or absence of super pixels. Often, simple perturbations are not enough. Ideally, the perturbations would be driven by the variation that is observed in the dataset. Manually steering the perturbations on the other is probably not a great idea, as it most likely would introduce bias into the model explanations. Conclusion LIME is a great tool to explain what machine learning classifiers or models are doing. As always, even when using LIME, it is still important to correctly interpret the output. Follow me on Medium or Twitter if you want to receive updates on my blog posts!

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2: TraderFeed: Understanding, Prediction, and What Makes Discretionary Traders Successful

ii Abstract Toward an Understanding and Prediction of Air Flow in Buildings Doctor of Philosophy, Joseph William Lstiburek Civil Engineering.

Registration opening soon It is highly recommended that you apply for a course at least weeks before the start date to guarantee there will be space available. After that date you may be placed on a waitlist. Courses with low enrollment may be cancelled up to 4 weeks before start date if sufficient enrollments are not met. If you are able to access the online application form, then registration for that particular course is still open. Registration for the session has closed. Developing understanding of how large data sets at various levels of detail can be used to gain insight on the dynamics of technological innovation Learning how to compare the rate of progress of various technologies and products Understanding the state of the art in theories of technological innovation, and their utility for particular questions faced in private industry and the public sector Learning how to apply data analysis and theory to guide investment and design decisions Gaining insight on technological innovation-related decisions faced in designing financial portfolios, research and development portfolios, and public policy Who Should Attend: This course is designed for people working in industries such as chemicals, life sciences, manufacturing, investment, energy, and public policy makers. Typical job roles will include: Research and development managers Executive level management in a variety of technology related firms Public policy makers working in technology-related areas Private investors interested in technology-related portfolio optimization Computer Requirements: Laptops with a recent version of Excel are required for this course. Participants should have administrator privileges to install programs, as standard Excel packages will be installed and used. Tablets will not be sufficient for the computing activities in this course. Lecture on evidence of technology innovation. What does the data suggest? Guided exercise on analyzing technology improvement trends. Participants will work in groups and report back on their assessment of the rates of innovation across various industries. Lecture on proposed models of technological innovation. How do we explain the observed evidence? Guided exercise on comparing the predictive ability of proposed models. Participants will fit the data with proposed models and test the performance of the models. We will identify and debate the best-performing models across various industries. Lecture on proposed theory relating the rate of technological innovation to design features of technologies. Which technologies improve fastest and why? Working in small groups, participants will consider the component dependencies and flexibility of various technologies and industries. Lecture on applying insights from data and theory to decision making in private firms and government. How can we optimize technology design decisions and investment portfolios? Participants will optimize technology portfolios in a context of interest: We will have an extended working lunch that will include further discussion and a free-form lecture by the professor on applications of specific interest to the class. The schedule will include a lunch break and a morning and afternoon coffee break each day. I think the program was run and organized very well. The course content and teaching pedagogy was very good and the fact that it was over 5 days actually helped me grasp this kind of topic much better since it needs time and lots of hands on work. Overall I would rate my experience quite high at MIT this summer. Trancik and her team did a great job of blending lecture materials, in class projects, night time reading assignments. Her work focuses on evaluating the dynamic costs, environmental impacts, other aspects of technology performance, and setting design targets to help accelerate the development of these technologies in the laboratory. This work involves assembling and analyzing expansive datasets and developing new quantitative models and theory. Many projects focus on electricity and transportation, with an emphasis on solar energy conversion and storage technologies. She earned a B. She has also worked for the United Nations and as an advisor to the private sector on investment in low-carbon energy technologies.

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3: Understanding model predictions with LIME â€“ Towards Data Science

Geophysical Fluid Dynamics Laboratory Review May , Understanding and prediction â€¢Unified approaches for variability and change, across time scales and phenomena.

A coordinated meteorological and oceanographic field campaign over the Iceland and southern Greenland Seas took place in February and March The aim being to characterise the atmospheric forcing and the ocean response of coupled atmosphere-ocean processes; in particular cold-air outbreaks in the vicinity of the marginal-ice-zone, and their triggering of oceanic heat loss and the generation of dense water masses. We observed the spatial structure and variability of surface flux fields in the region and the weather systems that dictate these fluxes, through the first meteorological field campaign in the Iceland Sea. This was done as part of a coupled atmosphere-ocean field campaign in winter involving a rare wintertime research cruise, airborne observations and a host of ocean and atmosphere observing systems. We made in-situ observations of air-sea interaction processes from several platforms. In this talk, I will present some highlights from the field campaign and discuss early findings from our research. Before then he was a research scientist at the British Antarctic Survey for 6 years and a postdoctoral research fellow in the Department of Physics at the University of Toronto for 3 years. His research is on dynamical and physical processes that are important for weather forecasting and climate prediction; in particular mesoscale dynamical meteorology, air-sea interaction, atmospheric forcing of the ocean and North Atlantic climate. He has particular expertise on these processes in the polar regions. He has published more than 70 peer-reviewed articles in the leading journals in the field and been the Principle Investigator in numerous NERC research grants. What connects Arctic clouds and sea ice? Ian Brooks, University of Leeds Abstract: The single largest source of uncertainty in climate models results from the representation of clouds; this is particularly so in the Arctic, where for much of the year low-level boundary-layer clouds dominate control of the surface energy budget. The time-evolution and properties of these clouds are intimately linked with their interactions with the surface and boundary layer structure. The properties of both clouds and boundary layer and indeed the surface are sub-grid-scale in climate and weather forecast models, and many important features are poorly represented by current parameterizations. Notably, observations show that the summer time boundary-layer over sea ice is often decoupled below cloud, inhibiting turbulent mixing â€” and hence the transport of aerosols and water vapour â€” between cloud and the surface. This decoupling is not reproduced by models. The controls on this turbulent structure are poorly understood. Here we will review the state of knowledge, and some of the recent research on Arctic boundary layer processes and its impact on clouds and the surface energy budget, and thus ultimately on the evolution of sea ice. He moved to San Diego and Scripps Institution of Oceanography and post-doctoral research in marine boundary layer meteorology, including surface atmosphere interactions and stratocumulus cloud processes. His research is split between the fields of air-sea interaction and Arctic boundary layer processes and their links to polar climate â€” almost all of which is based on direct measurements of these processes in the field. What are the challenges and priorities for improved prediction and climate monitoring of the Arctic? In order to improve both predictions in the Arctic on timescales from a few hours to seasons and reanalyses, which constitute a great tool for climate monitoring of the Arctic, work is needed in three areas: Arctic regions pose specific challenges for each of these three areas because model errors are large, in-situ observations are sparse, and satellite observations are difficult to use in data assimilation because of ambiguous signal properties, despite large data volumes. Furthermore, the current data assimilation systems are mostly tuned to perform optimally in mid-latitudes, and we first need to understand their suitability around the poles. Compared to previous similar initiatives, YOPP is indeed putting additional emphasis on numerical experimentation, in a concerted effort to exploit observations for model improvement and drive developments in data assimilation and the design of observing systems. Her research has so far covered boundary layer clouds and the factors controlling their distribution, aerosol-cloud interactions, turbulent diffusion in stable conditions, land-atmosphere coupling and impacts of surface, and more particularly orographic drag, on the large-scale circulation. The view from above Arctic snow at GHz: What can surface emissivity on these channels tell us

about snowpack stratigraphy? Chawn Harlow, Met Office Abstract: In March , the Met Office carried out an airborne campaign focussing on evaluation of snow microwave emission models in the GHz frequency range: The campaign collected ground-based snow pit measurements collated with airborne radiometric measurements that are being used to improve snow physical models for use in future NWP models. This presentation will 1 motivate the measurement campaign from both the snow remote sensing and the atmospheric data assimilation points of view and 2 discuss emissivity retrievals obtained during the campaign at 89, , , His PhD thesis focused on passive L-band remote sensing retrieval algorithms of soil moisture supported by laboratory measurements of dielectric properties at same frequency. Much time was spent measuring dielectric properties of wet sand and vegetation in the lab with the goal to understand how L-band emissivity changes with changes in soil and vegetation water content. In Chawn joined the Met Office where he was asked to study snow surface emissivities at much higher frequency GHz. During this time, he led various airborne campaigns: Why tundra snow is upside down in models, and why it matters Richard Essery, University of Edinburgh Abstract: Earth System and Numerical Weather Prediction models are beginning to use more sophisticated representations of snow on the ground, drawing on snow physics models that were first developed for avalanche prediction. These models have mostly been evaluated for deep mid-latitude mountain snow, however, and they neglect important physical processes occurring in shallow Arctic snow subjected to high winds and low temperatures. Understanding these processes is important for representing the thermal properties of Arctic snow and exploiting information from microwave remote sensing over snow-covered surfaces. He combines modelling with Arctic and alpine field studies. What are the limitations of Arctic sea ice remote sensing products, and what opportunities can they provide for improving predictive skill of Arctic forecasts? Such activities include commercial ventures like tourism, mineral and oil extraction, fishing, and shipping, along with activities of importance to local communities such as subsistence hunting and fishing, search and rescue, and community re-supply. Additionally, the presence of sea ice can considerably modify the exchange of heat and moisture between the ocean and atmosphere with consequences for near-surface meteorology and boundary-layer evolution. Accurate forecasts of Arctic sea ice â€" on a variety of different timescales â€" are therefore becoming increasingly important for the safety of human activities in the Arctic. In this talk, we shall provide a brief overview of how sea ice has been traditionally initialised in short-range NWP and seasonal prediction systems. We shall provide an overview of the passive microwave remote sensing products typically used for initialisation of sea ice concentration, as well as the, relatively new, satellite-derived sea ice thickness products currently available. Information shall be provided about how these observations are derived, what the uncertainties and limitations are, and what new avenues of research are currently underway to improve measurements of Arctic sea ice from space. Finally we shall illustrate the impact or potential impact of assimilating these products in our operational prediction systems. Before joining the Met Office, Ed was based at the University of Exeter where he obtained a MMath and PhD in applied mathematics, studying fluid flow in rapidly rotating spherical geometries. Programme 21st Nov

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4: How to Read Odds: 13 Steps (with Pictures) - wikiHow

It is worth exploring the logic and function of prediction for a few lines. Fundamentally, it seems that prediction is related to the effort to forecast the effects of interventions, the trajectory of existing trends, and the likely strategies of powerful social actors.

Innovative thinking about a global world Thursday, January 15, Predictions Image: Roger de La Fresnaye. We have a hard time answering questions like these: How much will the first installment of TARP improve the availability of credit within three months? Will the introduction of UN peacekeeping units reduce ethnic killings in the Congo? Will the introduction of small high schools improve student performance in Chicago? Will China develop towards more democratic political institutions in the next twenty years? Will American cities witness another round of race riots in the next twenty years? Here are some examples: Coalition casualties in the Afghanistan war will be greater in than in Illinois Governor Blogojevich will leave office within six months. Germany will be the world leader in solar energy research by link. The Chinese government will act strategically to prevent emergence of regional independent labor organizations. It is worth exploring the logic and function of prediction for a few lines. Fundamentally, it seems that prediction is related to the effort to forecast the effects of interventions, the trajectory of existing trends, and the likely strategies of powerful social actors. We often want to know what will be the net effect of introducing X into the social environment. We may find it useful to project into the future some social trends that can be observed in the present. And we can often do quite a bit of rigorous reasoning about the likely actions of leaders, policy makers, and other powerful actors given what we know about their objectives and their beliefs. We can try to forecast the outcome of the current impasse between Russia and Ukraine over natural gas by analyzing the strategic interests of both sets of decision-makers and the constraints to which they must respond. So the question is, what kinds of predictions can we make in the social realm? And what circumstances limit our ability to predict? Predictions about social phenomena are based on a couple of basic modes of reasoning: X percent of interventions will show improvement of variable Y. Here are some particular obstacles to reliable predictions in the social realm: How large is the effect? How does it weigh in relation to other possible causal factors? What other currently unrecognized causal factors are in play? These are frequently unsatisfied. So where does all this leave us with respect to social predictions? A few points seem relatively clear. Specific prediction of singular events and outcomes seems particularly difficult: Projection of stable trends into the near future seems most defensible -- though of course we can give many examples of discontinuities in previously stable trends. Projection of trends over medium- and long-term is more uncertain -- given the likelihood of intervening changes of structure, behavior, and environment that will alter the trends over the extended time. Predictions of limited social outcomes, couched in terms of a range of possibilities attached to estimates of probabilities and based on analysis of known causal and strategic processes, also appear defensible. The degree of confidence we can have in such predictions is limited by the possibility of unrecognized intervening causes and processes. The idea of forecasting the total state of a social system given information about the current state of the system and a set of laws of change is entirely indefensible. This is unattainable; societies are not systems of variables linked by precise laws of transition.

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5: Goals of Scientific Research

The understanding and prediction of turbulent flow P. BRADSHAW, BA Department of Aeronautics, Imperial College of Science and Technology, iondon.

Sometimes it takes a complete change of scenery to create a fresh mindset and renewed focus on what is essential--in life, as well as in trading. Recently I wrote a post that has found unusually strong interest from readers , focusing on what is most important in markets. The post was distinctive because it emphasized market understanding, not the prediction of markets. This is a very important distinction for discretionary traders. As a psychologist, I also know that those same behavior patterns occur in other people for other reasons, such as when they are deeply reflective about a challenge at work or when they are deeply frustrated about a situation. For those other people, the period of quiet might be followed by a burst of work effort--or a burst of anger. The quiet comes from a different place for my son, however, and has in the past led to periods of sad mood and poor work performance. With that understanding, I simply give him a hug and let him know that he is special to me. That reaching out is enough to bring him out of his shell and get him talking about what went wrong with his best friend. With the emotional release, he begins to feel better, short-circuiting the depressed feelings and helping him reengage with other life activities. In a different context, that is also what a great parent does. Understanding is built from the ground up, taking particulars and making sense of them, creating possible explanations. Prediction is a top-down process, starting with universal patterns and applying them to particular contexts. A meteorologist seeks prediction, making use of complex models that track temperature, humidity, wind, air pressure, etc. A historian seeks understanding, looking at the motives and cultural influences that lead to political, economic, and military decisions and outcomes. Each is an approach to knowledge: Sometimes the successful discretionary trader makes use of predictive models as inputs to decisions; the successful quantitative trader will ground models in sound market understanding. At the end of the day, however, quants trade their predictions and discretionary participants trade their understanding. One trades universal patterns; another trades insights specific to what is observed here and now in a particular market. What I realized in the Montana mountains is that the psychological challenges faced by traders often leads them to seek quick and artificial security in market predictions. Instead to staying grounded in what is happening here and now, as in the example of my response to my son, a frustrated or uncertain trader might look for answers in top-down predictions. If a psychologist were to do this, he or she would become emotionally tone-deaf, no longer tracking the meaning of the unique individual in the conversation. When discretionary traders leap to a mode of prediction, they often lose their feel for markets by imposing ideas that clash with the actual messages of "the tape". I propose that successful discretionary traders are successful for the same reason that people are successful in relationships: When we track who is in the market, what they are doing, and the price levels at which they are acting , we assemble the raw materials for understanding market activity. The same is true for the trading of markets: Quantitative information can assist the understanding of a discretionary trader; it can never substitute for it.

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6: Understanding Society: Predictions

Understanding, Prediction, and What Makes Discretionary Traders Successful This post was written from Glacier National Park in Montana. Sometimes it takes a complete change of scenery to create a fresh mindset and renewed focus on what is essential--in life, as well as in trading.

Various research methods are used in an attempt to satisfy these interests. But, before discussing the various designs used by researchers it is important to identify the goals of scientific research. Goals of Scientific Research Many researchers agree that the goals of scientific research are: Some individuals add control and application to the list of goals. Description Description refers to the procedures used to define, classify and categorize subjects and their relationships. Descriptions allow us to establish generalizations and universals. By gathering information on a large group of people, for instance, a researcher can describe the average member or the average performance of a member of the specific group being studied. Describing observations of large groups of people does not take away from the fact that there are important differences among individuals. That is, researchers merely attempt to describe subjects or events on the basis of average performance generally speaking. Alternatively, description allows researchers to describe a single phenomenon and or observations of a single person. In science, descriptions are systematic and precise. Scientific research makes use of operational definitions. Operational definitions characterize events, qualities and concepts in terms of observable operations, or procedures used to measure them. Researchers are interested in describing only things that are relevant to the study. They have no interest in describing observations that are irrelevant to the investigation. Prediction In addition developing descriptions, researchers make predictions. Descriptions of events often provide a basis for prediction. Predictions are sometimes made in the form of hypotheses, which are tentative, testable predictions concerning the relationships between or among variables. Hypotheses are frequently derived from theories, or interrelated sets of concepts that explain a body of data and make predictions. Prediction of later performance is of particular importance to researchers. Does eating a low-calorie diet increase chances of living longer? Does undergraduate GPA predict how well one will do in graduate school? Do high levels of intelligence predict avoidance of cognitive biases? When a variable can be used to predict another variable or variables we can say the variables are correlated. Correlation exists when different measures vary together, which makes it possible to predict values of one variable by knowing values of another variable. Keep in mind predictions are made with varying degrees of certainty. Correlation coefficients state the degree of relationship between the variables in terms of both strength and direction of the relationship. In other words, correlation coefficients determine how well measures co-vary. Explanation is achieved when the cause or causes of a phenomenon are identified. In order to determine cause and effect three pre-requisites are essential: Covariation of events relationship: The variables must correlate. To determine the relationship of two variables, it must be determined if the relationship could occur due to chance. Lay observers are often not good judges of the presence of relationships, thus, statistical methods are used to measure and test the existence and strength of relationships. Proper time-order sequence time precedence: For 1 to cause 2, 1 must precede 2. The cause must precede the effect. Elimination of plausible alternative causes non-spuriousness, or genuine: For a relationship between A and B to be nonspurious, there must not be a C that causes both A and B such that the relationship between A and B vanishes once C is controlled. The most difficult condition to be met when determining cause and effect relationships is the elimination of other plausible causes. Photo by Lisa Brewster , available under a Creative Commons attribution license. Understanding Research Methodology 3: Jamie has written seven books and co-authored one. Goals of Scientific Research. Retrieved on November 15, , from https:

7: Advances in Extratropical Cyclone Understanding and Prediction Since the Presidents' Day Storm

Multi-scale, mechanistic understanding of species-environment relations will likely contribute to better predictions about large scale problems, such as the establishment and spread of exotic species or alterations in community composition

with changing land use or climate.

8: Understanding Sports Betting Picks - Unfinished Man

The Royal Meteorological Society is the Learned and Professional Society for weather and climate. Our mission is to promote the understanding and application of meteorology for the benefit of all.

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