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MIT researchers demonstrate crowdsourcing to better forecast drug approvals

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In association with Novartis data scientists, MIT highlights the power of crowdsourcing in developing new models that leverage human and artificial intelligence to help biomedical stakeholders de-risk their portfolios

In late 2019, researchers at the MIT Laboratory for Financial Engineering (LFE) and the MIT Computer Science and Artificial Intelligence Laboratory (CSAIL) worked with Novartis—a leading global medicines company—to launch an in-house Data Science and Artificial Intelligence (DSAI) challenge to beat MIT's machine-learning models for predicting clinical trial outcomes. Results are available in an article in *Patterns*, a new open-access data science journal published by Cell Press.

The DSAI challenge was built on the work of the MIT research team led by Professor Andrew W. Lo, director of the LFE and principal investigator at CSAIL, and Kien Wei Siah and Chi Heem Wong, (CSAIL students in 2019) used data provided by Informa Pharma Intelligence collaborated with Novartis to validate key features previously found to be associated with regulatory approval, and to learn from industry experts about new features that can improve on our forecasts.

MIT model in association with Novartis data scientists incorporated their own insights into drug development timelines and which data entries should be discarded. They found that one of the strongest predictors of approval was the phase 2 accrual relative to the disease average and that prior approval for any indication, past approvals of other drugs for similar indications, and well-established mechanisms of action all improved the odds of approval. Strong indicators of failure, according to the team's model, were whether a drug targeted a therapeutic area that has historically demonstrated a much lower probability of success in clinical development (e.g., cancer or Alzheimer's disease), trial termination, poor patient enrollment, and the absence of an international nonproprietary name for a drug.

"All stakeholders are affected by the risk of drug development, so we were excited to have an opportunity to work with Novartis to better understand how artificial intelligence can be combined with human intelligence to lower this risk, as well as to lower the cost of capital to the biopharma industry," said Siah.

"The DSAI challenge highlights the promise of crowdsourcing in developing new predictive models, as well as the opportunity to develop more accurate models with additional data and a broader pool of challenge participants," added Prof. Lo. "We hope our experience can serve as a template for other universities and biopharma companies to collaborate on their own challenges."