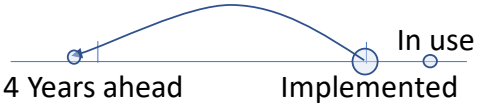
Research Statement – Theodore (Ted) Allen

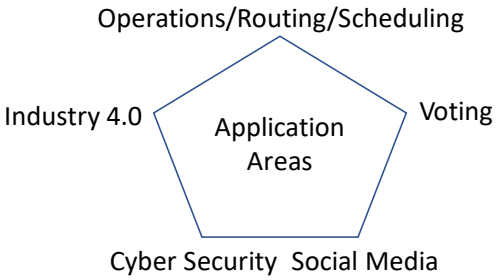
Purpose: Research is the primary way that educators aim to reimburse the world for all the resources we consume. To do this, we need a reasonable blend of applications and real innovation.

Impacts: Basic research obviously plays a seminal role in advancement, but applications research, by directly applying new techniques, greatly increases the chance that research will impact the world. Applications also make projections of future needs far more credible. While most of my research directly supports decision-makers who will directly use the methods (election officials, nurses, schedulers, and vehicle routers…), some aims to be truly forward-looking (directed topic models, fast Bayesian reinforcement learning, noisy simulation optimization, experimental design for off-line gaming , etc.)



Strategy: There is an implicit tradeoff in the choice of journals in which to seek publications. Despite the higher probability of rejection, highly selective journals have impressive reviewers who give helpful feedback. More accessible journals have the advantage of permitting greater freedom of expression while allowing the marketplace to determine what gets cited. My experience persistently submitting linear models and experimental designs to a difficult journal repeatedly, has taught me to use a more adaptive and successful strategy: push, learn, back off and pivot (if needed).

Topics: One of the advantages of both operations research and statistics is the ability to support many types of human activities. With this advantage comes the obligation to be *nimble* and pivot to the topics of interest (or what should be of current interest such as educating voters) in a timely way. In my topic selection, I have been increasingly successful in finding areas where grants are possible to obtain and real impacts can be measured (e.g., changing voting laws to get improved access, leading in social media analytics and cyber security, and helping industrial partners save money through routing and scheduling). One topic of increasing interest, in which industrial & systems engineers can leaders, is Industry 4.0. Basically, manufacturers and others, including vehicle designers, share their information and control with us researchers who can then use our multiple skills to improve outcomes.



Methods: The great innovators in our field have proposed innovative methods that are now in common use. Achieving such outcomes is my continuing objective. Some of my attempts have been quite ambitious including directed topic models with high-level data (a new way to communicate with more openness with machines) and fast Bayesian Reinforcement Learning (leveraging experimental design methods to improve learning rates in the field). Others have tried to extend or combine useful methods such as stretching efficient global optimization to noisy problems, making cyber maintenance modeling timely with social media data and combining experimental design and game theory. These cases all attempt to engage the most up-to-date methods and to provide innovation with good usability to entice adoption.