Tom (Hyeon Seok) Yu

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Experience

Amazon Web Services (AWS) — *Economist II, Central Economics & Science Team* Feb 2025 – Present

- **Transformer-Based Causal Inference:** Developed counterfactual revenue prediction system by fine-tuning Mistral-7B with LoRA on text-templated customer journeys (FSDP across 8 A100 GPUs; vLLM for 13.8x inference speedup) based on Athey et al.'s LABOR-LLM framework. Enables treatment effect estimation in multi-treatment, sequential-confounding settings where conventional causal inference methods like DiD/synthetic control might not be applicable.
- **Economic Impact Measurement ($163M Program):** Designed quasi-experimental evaluation using AIPW with doubly-robust estimation to correct for selection into treatment. Quantified causal revenue impact across heterogeneous customer segments, directly informing reallocation of multi-million dollar partner investment portfolio.
- **Growth Decomposition & Policy Analysis:** Built CLV framework (survival analysis + Random Survival Forest) decomposing growth into acquisition, retention, and per-customer trajectories. Delivered rapid causal analysis of credit and payment policies within 2 weeks (**est. $150M+ annual savings**).
- **Churn Measurement Framework:** Developed and validated standard-deviation-based churn metrics adopted by sales teams for real-time customer health monitoring and proactive retention interventions.

Tesla — *Senior Data Scientist, Core Business (Sales, Service, Delivery)* Apr 2024 – Feb 2025

- Built ML-based service demand forecasting for 250+ North American service locations (50% accuracy gain over baseline), directly informing staffing and capacity allocation decisions ($10M+ impact).
- Applied synthetic control methods to estimate causal sales lift from marketing campaigns; designed A/B tests with HTE estimation to identify high-conversion customer segments for targeted lead generation.

Netflix — *Experimentation & Causal Inference Intern* Jun – Sep 2023

- Developed IPW and entropy balancing methods to correct non-response bias in large-scale user surveys; built ensemble ML models (GBM, RF) as proxy quality metrics to guide content evaluation decisions.
- Collaborated cross-functionally with engineering and design teams to operationalize survey-based metrics into product decisions. Return offer.

Analysis Group — *Analyst, Economic Consulting* Aug 2016 – May 2017

- Applied DiD and instrumental variables methods to quantify macroeconomic impact of client products across Latin American markets. Supported expert testimony and policy briefs in litigation and regulatory proceedings.

Research

Dissertation: *Essays in Political Economy: Status Perceptions and Survey Experiments* Stanford GSB, 2024
Chair: Matthew Gentzkow · Committee: Neil Malhotra, Ken Shotts

- Conducted randomized survey experiment (N > 10,000) estimating causal effects of status perception shocks on populist attitudes. Applied HTE estimation, causal mediation analysis, and ordinal data methods for robustness.
- Proposed control-augmented Thompson Sampling algorithm for best-arm identification, demonstrating precision gains over uniform randomization in budget-constrained multi-arm experiments.

Selected Working Papers:

- *LLM-Based Causal Inference for Counterfactual Prediction* (2025) — Extends Athey et al.'s LABOR-LLM text-template approach to causal settings; LoRA-fine-tuned Mistral-7B as flexible estimators for HTE in panel data with sequential treatment histories.
- *Electoral Insecurity & Federal Spending: Panel Matching and Synthetic Control Methods* — Demonstrates improved covariate balance and robustness over conventional DiD using matching and synthetic control.
- *Predicting Roll Call Votes using Machine Learning Methods* (with F. Zhang) — Ensemble stacking of bill text embeddings and legislator features; outperforms existing prediction methods.

Education

Stanford University Stanford, CA
Ph.D., Political Economy · M.S., Statistics (Advisor: Percy Liang) 2017 – 2024
Coursework: Econometrics (panel, time series, structural), Machine Learning, Causal Inference, Labor Economics, NLP

Middlebury College Middlebury, VT
B.A., Economics, Summa Cum Laude · Phi Beta Kappa · Class Salutatorian 2012 – 2016

Technical Skills

Causal Inference: Difference-in-Differences, Synthetic Control, Propensity Score Methods (IPW, AIPW), Instrumental Variables, Regression Discontinuity, Matching, Survey Experiments, Best-Arm Identification

Economic Research: Large-Scale Data Analysis, Structural Estimation, Panel Econometrics, Time Series Forecasting, Heterogeneous Treatment Effects (HTE), Power Analysis, Sequential Testing

ML/AI: Transformers (Mistral-7B, LoRA fine-tuning, vLLM), Gradient Boosting (XGBoost, LightGBM), Random Forests, Survival Analysis, LSTM, NLP, Ensemble Methods

Programming: Python (pandas, scikit-learn, PyTorch, statsmodels, Hugging Face), SQL, R, Stata · Distributed training (FSDP), cloud infrastructure (AWS SageMaker)