

# Hoang Nguyen

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## EDUCATION

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**Georgetown University**  
*Ph.D. Candidate in Economics*  
Committee: Professors John Rust, Dan Cao, Whitney Newey

Washington, D.C., USA  
2020–2026 (expected)

**National Economics University**  
*B.A. Banking and Finance*

Hanoi, Vietnam  
2013–2017

## RESEARCH INTERESTS

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Econometrics, Machine Learning, and Operations Research

## WORKS IN PROGRESS

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### Neural Networks for Efficient Estimation of High-Dimensional Dynamic Discrete Choice Models (Job Market Paper)

*I propose the Neural-Network Efficient Estimator (NNES) for structural dynamic discrete choice models with high-dimensional state vectors. NNES replaces grid/sieve policy evaluation with a deep network for the value function and estimates structural parameters by maximizing a penalized likelihood that enforces the Bellman equation. I prove that (i) the policy-iteration map retains a zero Jacobian property, (ii) the resulting likelihood score is Neyman Orthogonal, and therefore (iii) the estimator is root-n-consistent and semiparametrically efficient while the information matrix remains block-diagonal. Here,  $n$  is the sample size. These properties hold under network approximation rates of order  $o(n^{-1/4})$ , attainable with over-parameterised Neural Nets for certain class of functions. I provide simulation evidence showing that NNES delivers the same precision as full-information maximum likelihood, demonstrating its attractiveness in high-dimensional settings.*

### Automatic Debiased Machine Learning for Dynamic Discrete Choice

*Numerous causal and structural effects rely on regression estimates, such as policy effects and parameter estimation in economic structural models. Such regressions may involve high-dimensional covariates, so machine learning approaches are of interest. However, combining machine learning methods with identifying equations can result in regularization and model selection bias. This paper introduces an automatic debiasing framework for High-Dimensional Dynamic Discrete Choice problems. This method does not require the analytical form of the bias correction term. It is applicable to all forms of regression learning techniques, including neural networks, random forests, Lasso, and other techniques available for high-dimensional data.*

### Machine Learning for Global Dynamic Stochastic General Equilibrium Models (with Dan Cao and Wenlan Luo)

*How well can neural networks approximate equilibrium policy functions in high-dimensional, highly nonlinear dynamic stochastic general equilibrium (GDSGE) models? We benchmark state-of-the-art deep learning solvers against a global time-iteration method with adaptive sparse grids (GDSGE-ASG) and propose an unsupervised approach that combines over-parameterized neural networks with fixed-point iteration to address issues of non-convergence and local minima. We establish a constructive equivalence between the GDSGE-ASG solution and neural networks. This mapping highlights why training neural networks is challenging: the equivalent GDSGE-ASG representation requires sparse weights of large magnitude, whereas standard deep learning methods tend to concentrate weights near zero. In the textbook RBC model with an investment irreversibility constraint, solution accuracy under deep learning improves monotonically with network width. Nevertheless, deep learning solvers remain slower and more prone to multiple solutions than GDSGE-ASG. Collectively, these findings provide concrete design principles for developing reliable, scalable global solution methods for high-dimensional DSGE models.*

## TEACHING EXPERIENCE

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### Georgetown University

*Instructor*

Washington, D.C., USA

2025

- ECON-1357 - Essential Mathematics for Economics

### Georgetown University

*Teaching Assistant*

Washington, D.C., USA

2021–2025

- ECON-2120 - Introduction to Econometrics
- ECON-122 - Economic Statistics
- ECON-2544 - International Finance
- ECON-122 – Introduction to Econometrics
- ECON-2102 - Intermediate Macro

## PROFESSIONAL EXPERIENCE

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### Georgetown University

*Research Assistant to Professor Dan Cao*

Washington, D.C., USA

2022

### TECHCOMBANK

*Quantitative Risk Analyst*

Hanoi, Vietnam

2017-2019

## HONORS AND AWARDS

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| Summer School in Dynamic Structural Econometrics at University of Lausanne Grant   | 2023      |
| Summer School in Dynamic Structural Econometrics at MIT Grant                      | 2022      |
| Georgetown University Summer Dissertation Fellowship                               | 2022      |
| Georgetown University Graduate School Fellowship                                   | 2020–2021 |
| Vietnam Education Foundation 2.0 Fellowship  | 2019      |
| National Economics University Dean's List Honor                                    | 2017      |
| National Economics University's Merit-based Scholarship for all eligible semesters | 2013-2017 |

## SEMINARS AND CONFERENCE PRESENTATIONS

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Econometric Seminar (2025, Georgetown); Annual Macro Meeting (2025, Georgetown); GCER Alumni Conference (2025, Georgetown); EconBrew Seminar (2025, Georgetown)

## REFERENCES

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### Professor John Rust

Georgetown University  
Department of Economics  
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### Professor Whitney Newey

Massachusetts Institute of Technology  
Department of Economics  
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