PATRICK HUMMEL

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CONTACT AND PERSONAL INFORMATION

Patrick Hummel
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PROFESSIONAL EXPERIENCE

Senior Director of Economics at Microsoft (March 2019-present)
Economics Statistical Analyst at Google (June 2016-February 2019)
Senior Research Scientist at Google (December 2013-May 2016)
Research Scientist at Google (June 2012-November 2013)
Research Scientist at Yahoo! (June 2010-June 2012)

EDUCATION

Stanford Graduate School of Business (2006-2010)
    Ph.D. in Economics (2010)

California Institute of Technology (2002-2006)
    M.S. in Chemistry (2006)
    B.S. in Applied and Computational Mathematics (2006)
    B.S. in Economics (2006)
    Graduated ranked first in undergraduate class

PUBLICATIONS

Hummel P, Nadav U. "Bid-limited targeting". *ACM Transactions on Economics and Computation* 7, 2 (2019) Article 5.

Hummel P, McAfee RP. "Evolutionary consumers imply monopolies exit". *International Economic Review* 59, 4 (2018) 1733-1746.

Ghosh A, Hummel P. "Cardinal contests". *ACM Transactions on Economics and Computation* 6, 2 (2018) Article 7.

Hummel P, Nadav U. "Bid-limited targeting". *Proceedings of the 2018 World Wide Web Conference* (WWW) (2018) 1329-1338.

Hummel P. "Hybrid mechanisms for Vickrey-Clarke-Groves and generalized second-price bids". *International Journal of Game Theory* 47, 1 (2018) 331-350.

Hummel P. "Reserve prices in repeated auctions". *International Journal of Game Theory* 47, 1 (2018) 273-299.

Hummel P. "How do selling mechanisms affect profits, surplus, capacity, and prices with unknown demand?" *Canadian Journal of Economics* 51, 1 (2018) 94-126.

Hummel P, McAfee RP. "Loss functions for predicted click-through rates in auctions for online advertising". *Journal of Applied Econometrics* 32, 7 (2017) 1314-1328.

Hummel P. "Endogenous budget constraints". *Mathematical Social Sciences* 88 (2017) 11-15.

Hummel P, McAfee RP. "Machine learning in an auction environment". *Journal of Machine Learning Research* 17, 197 (2016) 1-37.

Hummel P, McAfee RP, Vassilvitskii S. "Incentivizing advertiser networks to submit multiple bids". *International Journal of Game Theory* 45, 4 (2016) 1031-1052.

Hummel P, McAfee RP. "When does improved targeting increase revenue?" *ACM Transactions on Economics and Computation* 5, 1 (2016) Article 4.

Hummel P. "Position auctions with dynamic resizing". *International Journal of Industrial Organization* 45 (2016) 38-46.

Hummel P. "Simultaneous use of auctions and posted prices". *European Economic Review* 78 (2015) 269-284.

Hummel P, Knight B. "Sequential or simultaneous elections? A welfare analysis". *International Economic Review* 56, 3 (2015) 851-887.

Ghosh A, Hummel P. "Cardinal contests". *Proceedings of the 24th International Conference on the World Wide Web* (WWW) (2015) 377-387.

Hummel P, McAfee RP. "When does improved targeting increase revenue?" *Proceedings of the 24th International Conference on the World Wide Web* (WWW) (2015) 462-472.

Hummel P. "Strategic ambiguity about military capacity with multiple adversaries". *Journal of Theoretical Politics* 27, 2 (2015) 288-300.

Hummel P, McAfee RP. "Position auctions with externalities". *Proceedings of the 10th Conference on Web and Internet Economics* (WINE) (2014) 417-422.

Ghosh A, Hummel P. "A game-theoretic analysis of rank-order mechanisms for user-generated content". *Journal of Economic Theory* 154 (2014) 349-374.

Bhawalkar K, Hummel P, Vassilvitskii S. "Value of targeting". *Proceedings of the 7th International Symposium on Algorithmic Game Theory* (SAGT) (2014) 194-205.

Hummel P, Rothschild D. "Fundamental models for forecasting elections at the state level". *Electoral Studies* 35 (2014) 123-139.

Callander S, Hummel P. "Preemptive policy experimentation". *Econometrica* 82, 4 (2014) 1509-1528.

Hummel P, McAfee RP. "Machine learning in an auction environment". *Proceedings of the 23rd International Conference on the World Wide Web* (WWW) (2014) 7-18.

Hummel P. "Pre-election polling and third party candidates". *Social Choice and Welfare* 42, 1 (2014) 77-98.

Hummel P, Holden R. "Optimal primaries". *Journal of Public Economics* 109, 1 (2014) 64-75.

Hummel P, Morgan J, Stocken PC. "A model of flops". *RAND Journal of Economics* 44, 4 (2013) 585-609.

Hummel P. "Candidate strategies in primaries and general elections with candidates of heterogeneous quality". *Games and Economic Behavior* 78, 1 (2013) 85-102

Ghosh A, Hummel P. "Learning and incentives in user-generated content: multi-armed bandits with endogenous arms". *Proceedings of the 4th Innovations in Theoretical Computer Science Conference* (ITCS) (2013) 233-246.

Hummel P. "Resource allocation when different candidates are stronger on different issues". *Journal of Theoretical Politics* 25, 1 (2013) 128-149.

Hummel P. "Deliberative democracy and electoral competition". *Games and Economic Behavior* 75, 2 (2012) 646-667.

Ghosh A, Hummel P. "Implementing optimal outcomes in social computing: a game-theoretic approach". *Proceedings of the 21st International Conference on the World Wide Web* (WWW) (2012) 539-548.

Hummel P. "Sequential voting in large elections with multiple candidates". *Journal of Public Economics* 96, 4 (2012) 341-348.

Hummel P. "Deliberation in large juries with diverse preferences". *Public Choice* 150, 3 (2012) 595-608.

Hummel P. "Pre-election polling and sequential elections". *Journal of Theoretical Politics* 23, 4 (2011) 463-479.

Hummel P. "Proportional versus winner-take-all electoral vote allocations". *Public Choice* 148, 3 (2011) 381-393.

Hummel P. "Information aggregation in multicandidate elections under plurality rule and runoff voting". *Mathematical Social Sciences* 62, 1 (2011) 1-6.

Ghosh A, Hummel P. "A game-theoretic analysis of rank-order mechanisms for user-generated content". *Proceedings of the 12th ACM Conference on Electronic Commerce* (EC) (2011) 189-198.

Hummel P. "Abstention and signaling in large repeated elections". *Games and Economic Behavior* 72, 2 (2011) 586-593.

Hummel P. "Sequential voting when long elections are costly". *Economics and Politics* 23, 1 (2011) 36-58.

Hummel P. "Flip-flopping from primaries to general elections". *Journal of Public Economics* 94, 11 (2010) 1020-1027.

Hummel P. "On the nature of equilibria in a Downsian model with candidate valence". *Games and Economic Behavior* 70, 2 (2010) 425-445.

Hummel P. "Jury theorems with multiple alternatives". *Social Choice and Welfare*, 34, 1 (2010) 65-103.

Hummel P. "Buying supermajorities in a stochastic environment". *Public Choice*, 141, 3 (2009) 351-369.

Hummel P. "Iterative elimination of weakly dominated strategies in binary voting agendas with sequential voting". *Social Choice and Welfare*, 31, 2 (2008) 257-269.

Hummel P, Winkler JR, Gray HB. "Electronic structures of tetragonal nitrido and nitrosyl metal complexes". *Theoretical Chemistry Accounts*, 119, 1 (2008) 35-38.

Hummel P, Gray HB. "Strikingly similar electronic structures of $[Mn(N)(CN)_5]^{3-}$ and $[Mn(NO)(CN)_5]^{3-}$". *Coordination Chemistry Reviews*, 151, 4 (2007) 554-556.

Hummel P, Halpern-Manners N, Gray HB. "Electronic excited states of tetracyanonickelate(II)". *Inorganic Chemistry*, 45, 18 (2006) 7397-7400.

Hummel P, Winkler JR, Gray HB. "Electronic structures of *trans*-dioxometal complexes". *Dalton Transactions*, 1 (2006) 168-171.

Hummel P, Oxgaard J, Goddard WA III, Gray HB. "Ligand field excited states of metal hexacarbonyls". *Inorganic Chemistry*, 44, 7 (2005) 2454-2458.

Hummel P, Vaidehi N, Floriano WB, Hall SE, Goddard WA III. "Test of the Binding Threshold Hypothesis for olfactory receptors: Explanation of the differential binding of ketones to the mouse and human orthologs of olfactory receptor 912-93". *Protein Science*, 14, 3 (2005) 703-710.

Hummel P, Oxgaard J, Goddard WA III, Gray HB. "Ligand field strengths of carbon monoxide and cyanide in octahedral coordination". *Journal of Coordination Chemistry*, 58, 1 (2005) 41-45.

Lee JC, Langen R, Hummel P, Gray HB, Winkler JR. "α-Synuclein structures from fluorescence-energy transfer kinetics: Implications for the role of the protein in Parkinson's disease". *Proceedings of the National Academy of Sciences*, 101, 47 (2004) 16466-16471.

Hummel P. "On consecutive quadratic non-residues: a conjecture of Issai Schur". *Journal of Number Theory*, 103, 2 (2003) 257-266.

Hummel P. "Solid constructions using ellipses". *Pi Mu Epsilon Journal*, 11, 8 (2003) 429-435.

Hummel P. "Crucial decisions of the second world war". *The Concord Review*, 12, 1 (2001) 177-202.

WORKING PAPERS

Hummel P. "Value of sharing data".

Hummel P, McAfee RP. "Position auctions with externalities and brand effects".

Hummel P, Morgan J, Stocken PC. "A model of voluntary managerial disclosure".

Hummel P, Morgan J, Stocken PC. "Optimal firm (non-)disclosure".

Hummel P, Morgan J, Stocken PC. "Persuasion under second-order uncertainty".

PATENTS

Zhong Q, Mehta A, Hummel P, Bhawalkar KU, Sun S, Aggarwal G. "Optimized digital component analysis system". US Patent 10397056 (2019).

Hummel P. "Choosing allocations and prices in position auctions". US Patent 10269045 (2019).

Hummel P, Varian HR. "System and method for providing context-based third-party content". US Patent 10182123 (2019).

Hummel P, McAfee RP. "Performance based content item ranking". US Patent 9996851 (2018).

Hummel P, McAfee RP, Dillon JV, Harris CK, Lipus TS. "Ranking content items using predicted performance". US Patent 9256688 (2016).

US PATENT APPLICATIONS

Hummel P. "Content item configuration evaluation". US Patent Application 20180285937.

Hummel P, Nadav U. "Optimized digital component analysis system". US Patent Application 20180101526.

Hummel P, Nadav U. "Optimized machine learning system". US Patent Application 20180046940.

Hummel P, Schwarz M, Tao D. "Reputation systems in ride share platforms". US Patent Application 20170200321.

Hummel P. "Systems and methods for setting allocations and prices for content in an online marketplace". US Patent Application 20170061515.

Vassilvitskii S, Hummel P, Bhawalkar KU. "Valuing distribution data". US Patent Application 20170024775.

Hummel P, Vassilvitskii S, McAfee RP. "Incentivizing advertiser networks to submit multiple bids". US Patent Application 20170024758.

Hummel P. "Systems and methods for optimizing subsidies in an online auction". US Patent Application 20160292748.

Hummel P, Brodersen KH, Franosch JMP. "Identifying bidding strategies for content providers in online auctions". US Patent Application 20160217529.

Hummel P. "Content item configuration optimization". US Patent Application 20160210689.

Hummel P. "Setting allocations and prices in auctions with occasional remarketing ads". US Patent Application 20160078497.

Hummel P. "Throttling content". US Patent Application 20150379566.

Hummel P. "Determining the performance of a content network". US Patent Application 20150081397.

Hummel P, McAfee RP, Zinkevich MAM. "Ranking content items based on a value of learning". US Patent Application 20150066659.

Hummel P. "Value-based content distribution". US Patent Application 20150051985.

Hummel P. "Value-based content distribution". US Patent Application 20150051984.

Hummel P. "Determining a price associated with a winning bid". US Patent Application 20150039459.

Hummel P. "Content distribution through an exchange". US Patent Application 20150006300.

Hummel P, McAfee RP. "Predicting performance of content items using loss functions". US Patent Application 20140372202.

Hummel P, Nadav U. "Managing distribution parameter utilization". US Patent Application 20140324602.

Hummel P, Dillon JV, Harris CK, Lipus TS. "Dynamic reallocation of content item blocks". US Patent Application 20140310093.

Hummel P, Rothschild D. "Forecasting an outcome of an election". US Patent Application 20140032474.

Hummel P, Gulik T, Schwarz M, Smirnov S. "Valuation estimation". US Patent Application 20130166354.

DEFENSIVE PUBLICATIONS

Hummel P, Bayardo RJ, Sun S, Aggarwal G, Barman K, Bhawalkar KU, Crespo JF, Wang Y. "Allocation of advertising extensions and formats". Technical Disclosure Commons (2017) Defensive Publication Series 695.

Hummel P, Nadav U. "Setting allocations and prices in auctions". Technical Disclosure Commons (2016) Defensive Publication Series 120.

Hummel P, Harris C. "Incentivizing publishers to join a publisher network". Technical Disclosure Commons (2015) Defensive Publication Series 24.

PROGRAM COMMITTEES

ACM Conference on Economics and Computation (EC) (2013-2017, 2019) (senior PC in 2015)
Ad Auctions Workshop (2015)
Conference on Web and Internet Economics (WINE) (2015)
International Symposium on Algorithmic Game Theory (SAGT) (2014)
Workshop on Social Computing and User-Generated Content (SC-UGC) (2013, 2015)
World Wide Web Conference (WWW) (2013-2014, 2016-2019)

REFEREE

ACM Symposium on Theory of Computing (STOC); *ACM Transactions on Intelligent Systems and Technology*; *American Economic Journal: Microeconomics*; *American Economic Review*; *American Journal of Political Science*; *American Political Science Review*; *B.E. Journal of Theoretical Economics*; *Econometrica*; *Economic Inquiry*; *Economic Theory*; *Economics and Politics*; *European Economic Review*; *Games*; *Games and Economic Behavior*; *Google Faculty Research Awards*; *International Economic Review*; *International Journal of Industrial Organization*; *Journal of Artificial Intelligence Research*; *Journal of Economic Behavior and Organization*; *Journal of Economic Theory*; *Journal of Elections, Public Opinion & Parties*; *Journal of Law, Economics, and Organization*; *Journal of Mathematical Economics*; *Journal of Political Economy*; *Journal of Politics*; *Journal of Public Economics*; *Journal of the European Economic Association*; *Journal of Theoretical Politics*; *National Science Foundation*; *Operational Research*; *Operations Research*; *Proceedings of the National Academy of Sciences*; *Public Choice*; *Quarterly Journal of Political Science*; *RAND Journal of Economics*; *Review of Economic Studies*; *Review of Network Economics*; *Social Choice and Welfare*; *Swiss National Science Foundation*; *Theoretical Economics*; *Workshop on Internet and Network Economics* (WINE)

AWARDS

Outstanding Reviewer Award for the *26th International Conference on the World Wide Web* (2017)
Review of Economic Studies Excellence in Refereeing Award (2014)
Runner-up for Best Paper Award at the *21st International Conference on the World Wide Web* (2012)
Stanford Institute for Economic Policy Research Dissertation Fellowship (2009-2010)
Stanford Institute for Economic Policy Research Taube Fellowship (2008-2009)
National Science Foundation Graduate Research Fellowship in Economics (2006-2009)
Stanford Graduate School of Business Jaedicke Merit Award (2006-2007)
Sigma Xi Award for an outstanding piece of original scientific research at Caltech (2006)
Jack E. Froehlich Memorial Award for most promising junior at Caltech (2005)
Henry Ford II Scholar Award for best engineering student at Caltech (2005)
Eric Temple Bell Undergraduate Math Research Prize (2005)
Barry M. Goldwater Scholarship (2004)
USA Today All-USA College Academic Second Team (2004)
Herbert J. Ryser Scholarship for excellence in mathematics at Caltech (2004)
Carnation Upper Class Merit Scholarship for room and board at Caltech (2003, 2004, 2005)
Green Memorial Prize for most original undergraduate research paper at Caltech (2003)
Axline Merit Award, a four-year, full-tuition merit scholarship at Caltech (2002-2006)

MISCELLANEOUS ACHIEVEMENTS

US National Physics Olympiad Team (2002)
US National Chemistry Olympiad Team Invitee (2002)
Fédération Internationale des Échecs (World Chess Federation) Master (2000-present)
US National High School Chess Champion (1999)
US Chess Federation Senior Master (1999-present)
US Chess Federation National Master (1996-present)