
Charles R. Twardy

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PROFESSIONAL SUMMARY

Ph.D. research data scientist, principal investigator, critical thinker, teacher, and public speaker looking for challenging meaningful work with talented colleagues. I have written, won, and led a four-year multi-million-dollar research contract, designed experiments, gathered data, analyzed results, published papers, and presented to conferences and clients. I have taught critical thinking, computer science, psychology, and science studies to traditional and professional students. I have written much research code, organized or led several software projects, and established data management processes for secure analysis of sensitive information.

WORK

- ◇ **Principal Data Scientist**, Sotera Defense Solutions (2016+)
 - Working on a functional website classifier for DARPA MEMEX using Pandas, SciKit, Spark, and deploying via Hug; Supporting the University of Melbourne to design and build a crowdsourced reasoning/argumentation system for IARPA CREATE; Writing proposals for DARPA, NSF, and others.
- ◇ **Senior Data Scientist**, NTVI Federal for the Defense Suicide Prevention Office (DSPO) (2015–2016)
 - Led the “data” team supporting the Defense Suicide Prevention Office. Established procedures for secure handling and storage of personal health information so DSPO could secure key new data sources. Responded to quick-turn data requests from Congress, the media, and other stakeholders. Moved DSPO to SPSS and R for analysis. Advised on statistical and machine learning, notably Holm-Bonferroni multiple-hypothesis correction for a large early-warning system to answer frequent requests for suicide hotspot/trend analysis. Helped clear obstacles so talented analysts could do their work.
- ◇ **Adjunct Professor**, Argosy University (2015):
 - Taught PSY350 Physiological Psychology.
- ◇ **Research Assistant Professor**, George Mason University (2008–2015)
 - 2011–2015: PI, DAGGRE / SciCast crowdsourced forecasting project (\$11.6+M) developed the world’s first general-purpose exact combinatorial prediction market.
 - 2011–present: PI, SAR*Bayes* project on search theory and lost person behavior. \$16K NSF REU (2011), \$3K DHS SBIR Phase I, \$13K SBIR Phase II (via dbS Productions).
 - 2011–2015: Consultant in expert systems, machine learning, and evaluation.
 - 2011: Trajectory clustering and analysis using a Minimum Message Length (MML) framework (Center for Geospatial Intelligence)
 - 2008–2011: Counter-IED research: classifiers for threat attribution; BNs for rapid assessment. Spatial data mining. Bayesian search theory.
- ◇ **Senior Scientist**, OnLine Star, Inc. [OLS] (2007–2008, part-time through 2012.)
Project Scientist, Information Extraction & Transport, Inc. [IET] (2005–2007)
 - Machine learning, data analysis & modeling, esp. for DARPA and ONR.
- ◇ **Sole Proprietor**, Prior Analytics (2005–2006)
 - Bayesian and MML modeling for the Australian Lost Person Behavior report and the International SAR Incident Database (via \$25K SBIR Phase 2 subcontract)
- ◇ **Research Fellow**, Monash University Computer Science & Software Eng. (2000–2005)
 - Causal models research including SAR*Bayes* and the ARC-funded “Bayesian Networks for Epidemiology”; teaching, honors thesis supervision, consulting, software.

- FUNDING**
- ◇ **IARPA contract (PI)**, 2011–2015, \$11.6+M over 4 years. Bayesian combinatorial prediction markets for current-events forecasting. Part of the IARPA ACE and ForeST programs.
 - ◇ **DHS SBIR grant**, data analysis and scoring support to dbS Productions for search planning software. Phase I (\$3K) and Phase II (\$13K).
 - ◇ **NSF REU grant**, 2011, \$16K for two undergraduates to develop the MapScore website for rating probability maps. (Via collaboration with Brigham Young University)
 - ◇ **ARC grant**, 2003, AU\$150K, Bayesian networks for epidemiology; Organized and wrote the grant; subsequently served as postdoctoral fellow on the project (not PI)
 - ◇ **Monash Arts-IT grant**, 2003, AU\$10K, Causation & Bayesian networks: collaboration between Computer Science and Philosophy on the metaphysics of causal Bayes nets
 - ◇ **NSF Postdoctoral Research Fellowship**, 2000-2002, \$36K/yr. (Monash Univ.)
 - ◇ **National Science Foundation Graduate Research Fellowship**, 1994-1997.
- EDUCATION**
- ◇ **PhD, Cognitive Science and History & Philosophy of Science** Indiana University, Bloomington, 1999.
 - ◇ **BA, Interdisciplinary Distinguished Majors Program**, University of Virginia, Charlottesville, 1993.
- SKILLS**
- ◇ **Research Expertise:** Bayesian networks & causal models; machine learning, inductive & statistical inference; minimum message length (MML) methods; philosophy of science; critical thinking & argument maps; search theory
 - ◇ **Programming Languages:** Python; Q*Script;
Secondary Languages: R, VBA, C, C++ , Perl, Java, MATLAB
 - ◇ **Programming Toolkits** NumPy, PyLab, SciPy, Netica API, WEKA
 - ◇ **OS:** Linux, Unix, OS X, Windows, MS-DOS
 - ◇ **Software:** L^AT_EX, Emacs, command line, MS Office, Libre Office, Google Docs, etc.
- CLEARANCE** Top Secret, with SCI eligibility determined by AFCAF.
- SELECT PUBLICATIONS**
- ◇ Sava, E., Twardy, C., Koester, R., & Sonwalkar, M. 2016. “Evaluating Lost Person Behavior Models”. *Transactions in GIS*. 20:1, 38-53. February 1. DOI: 10.1111/tgis.12143. First published online: 24 Jun. 2015. <http://onlinelibrary.wiley.com/doi/10.1111/tgis.12143/abstract>
 - ◇ Twardy, Hanson, R., Laskey, K., Levitt, T. S., Goldfedder, B., Siegel, A., D’Ambrosio, B., Maxwell, D. 2014. “SciCast: Collective Forecasting of Innovation.” MIT Collective Intelligence Conference, Cambridge, June. http://blog.scicast.org/wp-content/uploads/2014/02/Twardy_etal_SciCast_Overview_CI2014.docx
 - ◇ Koester, R. J., Chiacchia, K. B., Twardy, C. R., & Frost, J. R. (2014). “Use of the Visual Range of Detection to Estimate Effective Sweep Width for Land Search and Rescue based upon Ten Detection Experiments in North America.” *Wilderness & Environmental Medicine*. 23-Jan-2014. <http://dx.doi.org/10.1016/j.wem.2013.09.016>.
 - ◇ Karvetski, C. W., Olson, K. C., Mandel, D. R., & Twardy, C. R. 2013. “Probabilistic Coherence Weighting for Optimizing Expert Forecasts.” *Decision Analysis* 10:4, pp.327–340. <http://dx.doi.org/10.1287/deca.2013.0281>.
 - ◇ Sun, W., Hanson, R., Laskey, K.B., & Twardy, C.R. (2012). “Probability and Asset Updating using Bayesian Networks for Combinatorial Prediction Markets.” In Proceedings of the 28th Conference on Uncertainty in Artificial Intelligence (UAI-2012). Catalina, CA: AUAI Press. Retrieved from <http://mason.gmu.edu/~wsun/publications/uai2012.htm>
 - ◇ Twardy, C.R., & Korb, K.B. 2011. “Actual caution by probabilistic active paths”. *Philosophy of Science*, 78:5 (December), 900-913. <http://dx.doi.org/10.1086/662957> (Supplements at <http://philsci-archive.pitt.edu/8878/>.)

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- ◇ Twardy, C. & Gardner, S. & Dowe, D. "Empirical Data Sets are Algorithmically Compressible: Reply to McAllister." *Studies in the History & Philosophy of Science, Part A* 36:2 391–402, June 2005. <http://dx.doi.org/10.1016/j.shpsa.2005.04.004>
 - ◇ Twardy, C. "Argument maps improve critical thinking." *Teaching Philosophy* 27:2, 95–116. June 2004.