Houssam Nassif, Ph.D. http://pages.cs.wisc.edu/∼hous21

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Principal Applied Scientist with a focus on Multi-Armed Bandit, Deep Reinforcement Learning, and Diversity Recommendation research. Proven track record in launching 27 business products across Amazon, Google, Cisco, and UW Health, that generated $2B incremental yearly revenue. More than 15 years experience in ML research, with 27 peer-reviewed papers in major ML venues, and 4 paper awards. Leading research across multiple cross-functional teams, and fostering company-wide science culture.

Work Experience

Amazon, Prime and Marketing   Seattle, WA
Principal Applied Scientist   August 2017–Present

- Principal scientist for Amazon's central marketing organization, advising Senior VP on strategy and working with multiple teams of engineers, scientists and marketers to achieve marketing vision.
- Established and oversaw Amazon's central dynamic experimentation and marketing content optimization platform, which generated 7M incremental Prime members, and $1B incremental yearly revenue.
- Co-invented a novel bandit algorithm that optimizes combinatorial personalized ad creation, resulting in 2.7M new Prime members, 500K incremental Alexa devices sold, and $500M in incremental ad revenue.
- Introduced state-of-the-art Best-Arm-Identification and always-valid p-value techniques to speedup experimentation and optimize for detecting winning treatments, increasing Prime signup rates by 30%.
- Proposed and researched a Boltzmann deep-learning shop-by-look algorithm for dynamic visual browsing, "amazon.com/discover." It is deployed in 700 furniture and softline categories, with $300M yearly revenue.
- Deployed deep contextual multi-armed bandits for advertisement targeting on internal and external webpages, generating $200M.

Amazon, Core Machine Learning   Seattle, WA
Machine Learning Scientist   July 2013–August 2017

- Fostered Amazon's science culture by co-organizing the second Amazon ML Conference and serving as Program Committee/Area Chair/Senior AC for subsequent installments; teaching at the ML University; running the ML Office Hours and Reading Group for a year; serving on organization committee for three Graduate Research Symposiums; partnering on five Amazon Research Award grants; advising on the conference policy and calibrating ML interviews; and reviewing for the internal publication process.
- Designed and implemented the first Amazon Instant Video recommender system using hybrid-filtering, providing personalized recommendations among 100K titles for 10M users, increasing revenue by $100M.
- Co-invented, developed and implemented an adaptive, personalized and diverse recommender for visual discovery, "amazon.com/stream." This adaptive submodular bandit model generated $1M in profit.
- Modified softlines ads targeting on mobile gateway to use contextual bandits, increasing revenue by 89%.
- Diversified Prime Music personalized recommendations using submodular functions, leading to an increase of 5M minutes streamed.
- MyHabit.com chief scientist, launched the first personalized widget which drove 3% of global sales; and improved cold-starts handling, increasing revenue by 5.4% for apparel and 10.7% for home.

University of Wisconsin Hospital and Clinics   Madison, WI
Clinical Informatics Postdoc Researcher   August 2012–June 2013

- Invented a new Statistical Relational Learning algorithm that optimizes the Uplift Modeling Bayesian Network, creating the first Probabilistic Relational Uplift Modeling algorithm.
- Invented the first SVM that directly optimizes the Uplift metric.
- Improved differential age-based breast cancer rule mining by 177%.

University of Wisconsin–Madison   Madison, WI
Machine Learning Research Assistant   August 2006–August 2012
- Invented both the first multi-relational and first probabilistic Uplift Modeling classifiers.
- Built the first free-text mammography information extraction tool. Tool was deployed at 6 international clinical research institutions, and incorporated in the national Radiology Lexicon project.
- Improved breast cancer diagnostic by 7.3% by augmenting Bayesian Networks with Differential Rules.
- Identified 22 genetic variants that significantly improve breast cancer risk prediction by 5.5%.
- Uncovered novel clinical and biochemical association rules using Inductive Learning Programming.
- Built a WordNet-based English-Ojibwe synset-translation tool, and embedded it into bilingual dictionary.
- Taught 4 different Computer Science courses.

Google   San Francisco, CA
Software Engineering Intern   May 2011–August 2011
- Used Genetic Algorithms to automatically tune Java Virtual Machine garbage collector settings. System optimized production services, generating $1M in yearly savings.

Cisco Systems   San Jose, CA
Software Engineering Intern   June 2008–August 2008
- Invented and implemented a Network Collaboration algorithm within Cisco Pulse, a search and analytics enterprise 2.0 platform to harness organization collective expertise.

Ministry of Defense   Yarzeh, Lebanon
Software Engineer and Database Administrator   April 2004–April 2005
- Managed the database for 40K civil and military personnel; worked on secret clearance projects.

American University of Beirut   Beirut, Lebanon
Lecturer and Bioinformatics Research Assistant   September 2000–June 2006
- Designed and implemented the first protein-glucose binding-site classifier using SVM and Random Forests.
- Built a computational model of the evolution of the genetic code using Genetic Algorithms.
- Researched cellular and molecular mechanisms of hpoxic tumor cells.
- Taught 10 Computer Science courses.

Technical and Other Skills
- 15+ years of experience programming in Python, Java, C/C++, Perl, and R.
- Working knowledge of SQL, Tableau, Visual Basics, Prolog, Pascal, MPI, XML, HTML, SPSS, Power-Builder, MATLAB, and Maple.
- Fluent in English, French and Arabic.
- Trainer in non-violent communication, conflict resolution, and team building techniques.
- Starred in three Amazon ML research videos (https://www.youtube.com/watch?v=ELdvxQilXWo, https://www.youtube.com/watch?v=G-omu$_k i7YM$).
- Reviewer for 20 academic publishing venues.

Leadership and Awards
- Board Member: Center for Trustworthy Machine Learning, TruviTech, Lebanese Association for Democratic Elections, Amnesty International-Lebanon, GreenPeace-Lebanon.
- Conference Chair: AISTATS, Amazon Machine Learning Conference.
- Won 4 paper awards: KDD, RecSys, Amazon Research Scientist Summit, ACS Chemical Biology.
- Co-authored 5 academic partnership proposals that won the Amazon Research Award.
- International Student Leadership and Academic Achievement Awards, University of Wisconsin-Madison.
- Citizen-Based Monitoring Partnership Program Grant, WI Department of Natural Resources.

- Merit Award Scholarship (top 2 university students), American University of Beirut.

Education

Ph.D. in Computer Science — August 2012
Ph.D. Minor in Statistics — May 2009
University of Wisconsin–Madison — Advisers: Drs. David Page, Jude Shavlik

M.S. in Computer Science — June 2006
American University of Beirut — Adviser: Dr. Walid Keyrouz

B.S. in Biology (with Distinction) — June 2001
American University of Beirut

French Baccalaureate (with High Distinction) — June 1997

Peer-Reviewed Publications

Journals

1. Nabi, S., Nassif, H., Hong, J., Mamani, H. & Imbens[1], G. Bayesian Meta-Prior Learning Using Empirical Bayes. *Management Science* **68,** 1737–1755 (2022).

2. Al-Ali, H., Lee, D.-H., Danzi, M. C., Nassif, H., Gautam, P., Wennerberg, K., Zuercher, B., Drewry, D. H., Lee, J. K., Lemmon, V. P. & Bixby, J. L. Rational Polypharmacology: Systematically Identifying and Engaging Multiple Drug Targets To Promote Axon Growth. *ACS Chemical Biology* **10. Cover article**, 1939–1951 (2015).

3. Ayvaci, M. U., Alagoz, O., Chhatwal, J., Munoz del Rio, A., Sickles, E. A., Nassif, H., Kerlikowske, K. & Burnside, E. S. Predicting Invasive Breast Cancer versus DCIS in Different Age Groups. *BMC Cancer* **14** (2014).

4. Santos, J. C. A., Nassif, H., Page, D., Muggleton, S. H. & Sternberg, M. J. E. Automated identification of protein-ligand interaction features using Inductive Logic Programming: A hexose binding case study. *BMC Bioinformatics* **13** (2012).

5. Percha, B., Nassif, H., Lipson, J., Burnside, E. & Rubin, D. Automatic Classification of Mammography Reports by BI-RADS Breast Tissue Composition Class. *Journal of the American Medical Informatics Association (JAMIA)* **19,** 913–916 (2012).

6. Nassif, H., Al-Ali, H., Khuri, S. & Keirouz, W. Prediction of Protein-Glucose Binding Sites Using Support Vector Machines. *Proteins: Structure, Function, and Bioinformatics* **77,** 121–132 (2009).

Conferences

7. Li, Z., Ratliff, L., Nassif, H., Jamieson, K. & Jain, L. *Instance-Optimal PAC Algorithms for Contextual Bandits* in *Conference on Neural Information Processing Systems (NeurIPS)* (2022).

8. Fiez, T., Gamez, S., Chen, A., Nassif, H. & Jain, L. *Adaptive Experimental Design and Counterfactual Inference* in *Workshops of Conference on Recommender Systems (RecSys)* (2022).

9. Jun, K.-S., Jain, L., Mason, B. & Nassif, H. *Improved Confidence Bounds for the Linear Logistic Model and Applications to Bandits* in *International Conference on Machine Learning (ICML)* (2021), 5148–5157.

10. Geng, S., Nassif, H., Manzanares, C. A., Reppen, A. M. & Sircar, R. *Deep PQR: Solving Inverse Reinforcement Learning using Anchor Actions* in *International Conference on Machine Learning (ICML)* (2020), 3431–3441.

11. Biswas, A., Pham, T. T., Vogelsong, M., Snyder, B. & Nassif, H. *Seeker: Real-Time Interactive Search* in *International Conference on Knowledge Discovery and Data Mining (KDD)* (2019), 2867–2875.

12. Sawant, N., Namballa, C. B., Sadagopan, N. & Nassif, H. *Contextual Multi-Armed Bandits for Causal Marketing* in *Workshops of International Conference on Machine Learning (ICML)* **Amazon Research Scientist Summit best paper award** (2018).

13. Hill, D. N., Nassif, H., Liu, Y., Iyer, A. & Vishwanathan, S. V. N. *An efficient bandit algorithm for realtime multivariate optimization* in *International Conference on Knowledge Discovery and Data Mining (KDD)* **Audience appreciation award** (2017), 1813–1821.

14. Teo, C. H., Nassif, H., Hill, D., Srinavasan, S., Goodman, M., Mohan, V. & Vishwanathan, S. V. N. *Adaptive, Personalized Diversity for Visual Discovery* in *Conference on Recommender Systems (RecSys)* **Best short paper award** (2016), 35–38.

15. Nassif, H., Cansizlar, K. O., Goodman, M. & Vishwanathan, S. V. N. *Diversifying Music Recommendations* in *Workshops of International Conference on Machine Learning (ICML)* (2016).

16. Kuusisto, F., Santos Costa, V., Nassif, H., Burnside, E., Page, D. & Shavlik, J. *Support Vector Machines for Differential Prediction* in *European Conference on Machine Learning (ECML)* (2014), 50–65.

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[1]Guido Imbens is the 2021 Nobel Economics Prize laureate

17. Nassif, H., Kuusisto, F., Burnside, E. S., Page, D., Shavlik, J. & Santos Costa, V. *Score As You Lift (SAYL): A Statistical Relational Learning Approach to Uplift Modeling* in *European Conference on Machine Learning (ECML)* (2013), 595–611.

18. Nassif, H., Kuusisto, F., Burnside, E. S. & Shavlik, J. *Uplift Modeling with ROC: An SRL Case Study* in *International Conference on Inductive Logic Programming (ILP)* (2013), 40–45.

19. Liu, J., Page, D., Nassif, H., Shavlik, J., Peissig, P., McCarty, C., Onitilo, A. A. & Burnside, E. *Genetic Variants Improve Breast Cancer Risk Prediction on Mammograms* in *American Medical Informatics Association Symposium (AMIA)* (2013), 876–885.

20. Kuusisto, F., Dutra, I., Nassif, H., Wu, Y., Klein, M. E., Neuman, H. B., Shavlik, J. & Burnside, E. S. *Using Machine Learning to Identify Benign Cases with Non-Definitive Biopsy* in *International Conference on E-Health Networking, Application & Services (HealthCom)* (2013), 283–285.

21. Nassif, H., Santos Costa, V., Burnside, E. S. & Page, D. *Relational Differential Prediction* in *European Conference on Machine Learning (ECML)* (2012), 617–632.

22. Nassif, H., Wu, Y., Page, D. & Burnside, E. S. *Logical Differential Prediction Bayes Net, improving breast cancer diagnosis for older women* in *American Medical Informatics Association Symposium (AMIA)* (2012), 1330–1339.

23. Nassif, H., Cunha, F., Moreira, I., Cruz-Correia, R., Sousa, E., Page, D., Burnside, E. & Dutra, I. *Extracting BI-RADS Features from Portuguese Clinical Texts* in *International Conference on Bioinformatics and Biomedicine (BIBM)* (2012), 539–542.

24. Dutra, I., Nassif, H., Page, D., Shavlik, J., Strigel, R. M., Wu, Y., Elezaby, M. E. & Burnside, E. *Integrating Machine Learning and Physician Knowledge to Improve the Accuracy of Breast Biopsy* in *American Medical Informatics Association Symposium (AMIA)* (2011), 349–355.

25. Nassif, H., Page, D., Ayvaci, M., Shavlik, J. & Burnside, E. S. *Uncovering Age-Specific Invasive and DCIS Breast Cancer Rules Using Inductive Logic Programming* in *International Health Informatics Symposium (IHI)* (2010), 76–82.

26. Nassif, H., Woods, R., Burnside, E., Ayvaci, M., Shavlik, J. & Page, D. *Information extraction for clinical data mining: A mammography case study* in *Workshops of International Conference on Data Mining (ICDM)* (2009), 37–42.

27. Nassif, H., Al-Ali, H., Khuri, S., Keirouz, W. & Page, D. *An Inductive Logic Programming Approach to Validate Hexose Biochemical Knowledge* in *International Conference on Inductive Logic Programming (ILP)* (2009), 149–165.

Patents

28. Nassif, H., Hill, D., Hu, T., Iyer, A. M., Liu, J., Liu, Y., Srinivasan, S. & Swaminathan, V. *pat.* 11126785 (2021).

29. Srinivasan, S., Nassif, H., Mohan, V., Swaminathan, V. & Goodman, M. H. *pat.* 9817846 (2017).