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Professional Focus

On March 2016, AlphaGo, a Google Artificial Intelligence program, defeated a former world champion in what it was thought to be an impossible game. Go has more combinations than atoms in the universe. Intuition, human or artificial, is needed to play a proper game, more so to beat a champion! Machine Learning has evolved dramatically in recent years and it is applied to a broad spectrum of problems from Go to medicine. Specifically in medicine, the

query ?machine learning? on www.pubmed.gov [3] returns nearly 10,000 articles. The transition to the clinic, however, has seen limited success, and there has been little dissemination into clinical practice. All machine-learning algorithms have some degree of inaccuracy, which leaves physicians with the question of what to do when their intuition and experience disagree with an algorithm?s prediction. Most human experts, especially physicians, will override the algorithm in these cases. In medicine and other fields where misclassification has a high cost, average prediction accuracy is not the only desirable trait; interpretability is also a key factor. In the department of Radiation Oncology at UCSF we have worked in close collaboration with the Department of Computer and Information Science at University of Pennsylvania to develop the most accurate interpretable machine-learning algorithm to date: Mediboost (submitted to Science, March 2016). In a performance comparison to 4 different algorithms in 13 different medical problems, that go from predicting Parkinsons diseases to survival after surgery, Mediboost showed both state of the art accuracy compared to ensemble methods (the most accurate algorithms) while growing a Decision Tree (the most interpretable algorithm). Mediboost simulates the way physicians think by finding subpopulations of patients that all comply with certain rules and have the same classification. The interpretability of Mediboost allows physicians without knowledge of the underlying mathematical framework to understand why predictions are being made. This interaction between humans and algorithms can provide more accurate and reliable diagnoses than either method alone. The development of interactive and interpretable Machine Learning Algorithms and their applications will be the focus of my research career.

Education

2001-2005	University of Havana	BS	
2005-2007	University of Havana	MS	Radiochemistry
2007-2013	University of California, Los Angeles	PhD	Biomedical Physics

Professional Experience

2016-present	University of California, San Francisco	Assistant Clinical Professor	Radiation Oncology
2014-2016	University of Pennsylvania	Medical Physics Resident	Radiation Oncology
2013-2014	University of California, San Francisco	Postdoctoral Fellow	Radiation Oncology

Awards & Honors

2006	Suma Cum Laude, Higher Institute of Applied Science and Technologies (InSTEC)
2009	Nomination to the Best Young Researcher Award, Cuban Academy of Science
2010	Eugene V. Cota-Robles Fellowship, University of California

2012	Best Oral Presentation, Biomedical Physics Symposium, University of California
2012	Research Supplements to Promote Diversity in Health-Related Research, NIH
2013	First Place, Best Graduate Student Norm Baily Award, AAPM Southern California Chapter
2015	First Place, Young Investigator Award, AAPM Delaware Chapter

Recent Significant Publications :

G. Valdes, J M Lunas, Earic Eaton, C B Simone, Lyle H Ungar and T D Solberg. ?MediBoost: a Patient Stratification Tool for Interpretable Decision Making in the Era of Precision Medicine.? Scientific Reports 6. Article Number: 37854. November 2016.

G. Valdes, T.D. Solberg, M. Heskel, L.H. Ungar,, C.B. Simone. ?Using machine learning to predict radiation pneumonitis in patients with stage I non-small cell lung cancer treated with stereotactic body radiation therapy.? PMB, Volume 61, N 16. 2016.

G. Valdes, R. Scheuermann, M. Bellerive, A. Olszanski, C. Hung, T. D. Solberg. A mathematical framework for virtual IMRT QA using machine learning.. Accepted for publication at Medical Physics. June 2016.

G. Valdes, O. Morin, Y. Valenciaga, N. Kirby, J. Pouliot, C. Chuang "Use of True Beam developer mode for Imaging QA." J Appl Clin Med Phys, 6(4):322-333, 2015.

M. Takahashi*, G. Valdes*, K. Hiraoka, A. Inagaki, S. Kamijima, E. Micewicz, H.E. Gruber, J.M. Robbins, D.J. Jolly, W.H. McBride, K.S. Iwamoto, N. Kasahara . "Radiosensitization of gliomas by intracellular generation of 5-fluorouracil potentiates prodrug activator gene therapy with a retroviral replicating vector. Cancer Gene Therapy. (10):405-10, 2014 *Co-first authors

G. Valdes, C. Robinson, P. Lee, D. Low, K Iwamoto, J. Lamb.Tumor control probability and the utility of 4D vs 3D dose calculations for stereotactic body radiotherapy for lung cancer. Med Dosim, 40(1):64-9, 2014.

G Valdes, R. Schulte, M Ostermeier, K S Iwamoto. "The High-affinity Maltose Switch MBP317-347 has Low Affinity for Glucose: Implications for Targeting Tumors with Metabolically-Directed Enzyme Prodrug Therapy." Chem Biol & Drug Design. 83(3):266-71, 2014. (COVER OF MARCH ISSUE).

G Valdes and K.S. Iwamoto. Re-evaluation of cellular radiosensitization by 5- fluorouracil: High-dose, pulsed administration is effective and preferable to conventional low-dose, chronic administration". Int J Radiat Biol. 89(10):851-62, 2013.

G. Valdés-Díaz, S. Rodríguez-Calvo, M. Rapado-Paneque, A. Pérez-Gramatges, F. A. Fernández, E. Frota, C. Ribeiro. Effects of gamma radiation on phase behaviour and critical micelle concentration of Triton X-100 aqueous solutions.J Colloid and Interface Science 311:253-261,2007.

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Links
[1] mailto:Gilmer.Valdes@ucsf.edu
[2] https://radonc.ucsf.edu/make-gift
[3] http://www.pubmed.gov