Mark Changizi

Expertise with the human experience

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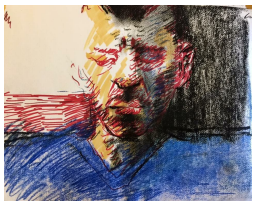

Skills

QUANTITATIVE ANALYST: Ph.D. in applied mathematics and computer science, with 25 years of wisdom rigorously solving data-rich problems in a variety of complex areas, from neurotechnology to human factors to marketing to artificial intelligence.

HUMAN EXPERIENCE: Expertise at the border of cognition and computation, including behavioral science, perception, human factors, UX, HCI, HMI, augmented reality, affective computing and AI. See his Human Factory.

MARKETING and PR: 10 years online marketing for his startup, VINO OPTICS, leading to hundreds of magazine and newspaper stories, and tens of thousands of sales. 15 years of proactive marketing and PR of his discoveries and his line of books.

CONSUMER INSIGHTS: Research prowess in the realm of understanding the human perceptual experience with a brand. (E.g., he keynoted the 2010 IIR USA Shoppers Insight conference.)

UX: Extensive experience with human subjects, questionnaires, psychophysics, A/B testing, statistical analysis, qualitative big picture analysis, innovative rather than mere incremental improvements.

ENTREPRENEUR: Proficient at transforming abstract ideas into reality, such as his medical device company, VINO OPTICS, emanating from a research discovery of his on the origins of color vision. Has a couple patents, his second with Yamaha and Caltech concerning a novel augmented reality device for enhanced driver safety.

LEADERSHIP: 20 years of experience managing and directing research teams, including at University College Cork (computer science), Duke University (psychology), Caltech (vision) and Rensselaer Polytechnic Institute (cognitive science).

COMMUNICATION: Has given more than one hundred keynotes worldwide, often appears on television such as Brain Games on National Geographic, given several TED talks, written for dozens of magazines such as WIRED and WSJ, and is working on his sixth book.

Experience

2ai Labs, Institute for the Study of Human and Machine Cognition / VP Research and Development, Director of Human Cognition
http://2ai.org
2010 - PRESENT, Columbus, OH

A private think tank and start-up generator co-founded by him with the aim of producing innovative research in cognitive science and artificial intelligence, and spinning off start-ups. VINO OPTICS (below) was their first start-up, based on patents emanating from his color research, and there are others on the conveyor belt including on affective computing and emotional artificial intelligence.

VINO OPTICS / Founder & CEO; VP Marketing http://vinOOptics.com
2010 - PRESENT, Columbus, OH

This medical device company emanates from a major 2006 discovery of his that primate red-green vision evolved for detecting oxygenation modulations of blood under the skin so that primates could see emotions, health and state. Out of that discovery, he and a colleague were able to patent the first and only optical filter technology that passively augments visibility of these oxygenation modulations, as well as related technology.

VINO OPTICS serves two main markets. (1) Medical personnel wear their vein glasses, protective eyewear that enhances visibility of veins and health signs. They also sell distinct wound care technology that augments visibility of blood pooling and poor circulation. Their vein glasses technology has been shown to work in the *Journal of Emergency Medical Services*. (2) Colorblind people wear one of their technologies which enhances the signal that red-green vision is for and that color deficients are deficient at. Unlike their competitors, their tech has been shown to aid colorblindness in *Invest Ophth Vis Sci*.

Human Factory / Founder & CEO
https://humanfactorylab.com/
2009 - PRESENT, Columbus, OH

Lab and consulting firm bringing cutting edge insights from the cognitive sciences to the next generation of human-centered technology. Has worked with more than 50 companies, with applications in human factors, consumer experience, UX, HMI, UI, augmented reality, interfaces, affective computing, health, entertainment, movies, video games.

Yamaha / Augmented Reality & HMI Consultant
2016 - 2019, Pasadena, CA

Consultant developing and testing novel technology for enhanced perception of a motorist's surrounding, for safety and a richer experience. It involved devising new theoretical technologies often based around Mark's earlier discoveries in visual and auditory perception, and directing experiments to test the efficacy of those technologies. Led to a new patent and a new prototype.

MONA Museum / Guest Scientist, Human-Tech Interface Curator

2014 - 2017, Hobart, Tasmania, Australia

Invited by MONA founder, David Walsh, to be one of four external guest curators for a six month exhibition, On the Origin of Art, at his famous art museum in Hobart, Australia. The show had international press, and highlighted Mark's research on the origins of writing, speech, music, and the arts. It led to a joint book with the same title with the other invited guest curators, Steven Pinker, Geoffrey Miller, and Brian Boyd.

Department of Cognitive Science, RPI / Assistant Professor

2007 - 2010, Troy, NY

Researcher in cognitive science, as well as two courses per semester teaching. Many publications while here, as well as his first trade (i.e., non-academic-monograph) book, *VISION rEVOLUTION*, about the function and design of vision, covering many of his own discoveries in the area of visual perception, including why we evolved color vision, why we see illusions, why some animals (like us) have forward-facing eyes, how we came to have writing. Directed a team of researchers in his lab.

Caltech / Sloan-Swartz Fellow in Theoretical Neurobiology

2002 - 2006, Pasadena, CA

Mark was awarded a two year Sloan-Swartz fellowship at Caltech. He then extended it to two more years via winning an NIH fellowship. He collaborated with vision scientist Shinsuke Shimojo. With great independence, and inspiration from those around him, a wide variety of his discoveries came to fruition while here.

Department of Neuroscience, Duke / Postdoctoral Fellow

1999 - 2002, Durham, NC

Researcher in the brain sciences, Mark worked in the lab of Dale Purves, and then in the lab of Ted Hall. He studied vision and the ontogeny of thirst and hunger behavior, and had tremendous freedom to work on a variety of other research areas, leading for example to his "perceiving the present" work on why we see illusions.

Schafer Corporation / Neurotechnology Researcher

1998 - 1999, Fairfax, VA

Researcher in neurotechnology and computational neuroscience. Developed novel computational and statistical methods and software for detecting the presence of correlated activity in neuronal populations for a new neuronal ensemble recording device.

Department of Computer Science, University College Cork / Assistant Professor

1997 - 1998, Cork, Ireland

Researcher in cognitive and computer science, as well as one introductory computer algorithms course per semester teaching. Worked here on his first book, The *Brain from 25000 Feet*.

Misc Teaching / Research Positions while undergrad / grad

1989 - 1997,

- 1993-1997. Theor neuroscience research, w/ Dr. Cherniak, UMD
- 1996-1997. Teaching assistant for calculus
- 1994-1997. Lecturer for logic, and also education-major math
- 1992-1995. Lab teacher, physics and astronomy, George Mason
- 1991. Post-grad researcher, Fly's Eye, University of Utah
- 1990-91. Undergrad researcher for SLAC
- 1990. Undergrad researcher at FermiLab, Experiment 771
- 1989. Undergrad researcher in physics lab, Prof. Deaner, UVA

Education

University of Maryland / PhD, Applied Mathematics

1992 - 1997, College Park, MD

PhD was in applied mathematics, more specifically on complexity theory, algorithms, theory of computation, and mathematical logic. In addition to being the usual teaching assistant -- often the primary lecturer -- in a variety of math classes, and teaching physics and astronomy at nearby George Mason University, he worked in the laboratory of theoretical neuroscientist and philosopher Chris Cherniak, thereby also acquiring a background in the cognitive and brain sciences, allowing him to later postdoc in those fields, and eventually become a theorist in the field.

University of Virginia / Bachelor of Science, Physics and Math

1987 - 1991, Charlottesville, VA

Double majored in physics and math, and chose the more difficult B.S. rather than B.A. route. Worked as an undergrad researcher during those undergrad years at a variety of physics labs, including FermiLab, Fly's Eye and SLAC.

Thomas Jefferson High School for Science and Technology / Diploma

1986 - 1987, Alexandria,, VA

Applied and was accepted to the new magnet school in northern Virginia the year it opened. This was a great experience, preparing Mark well for his next step at UVA physics and math.

BACKGROUND

More than your traditional UX / HCI / HMI / human factors researcher, Mark has major research discoveries in their foundations, with deep expertise in our perceptual and cognitive capabilities, and in how to optimize stimuli and interfaces for those capabilities.

1. In 2006 he discovered that color vision is for seeing emotions, health and state on the bare skin of others. That's why colors are emotionally evocative! By understanding what colors *mean*, one can more ably use colors in designs.
   https://www.changizi.com/uploads/8/3/4/4/83445868/colorface.pdf

2. He was the first to show that writing systems (like our alphabet) are optimized for the human visual system. In particular, letters have gotten shaped "like nature," namely like the contour-combinations that happen in natural scenes amongst objects. By so doing, writing harnesses our visual object recognition system for the new, non-evolutionary task reading.
   https://www.changizi.com/uploads/8/3/4/4/83445868/junction.pdf

3. Mark was the first scientist to understand the mechanisms underlying the use of blur lines in art and design, which elicit a faux perception of movement. He showed that such stimuli induce perceptual illusions concerning the brain trying to perceive the next moment. See his TED talk on the topic: https://www.youtube.com/watch?v=1xcvWSeZPbw

4. In 2005 he showed how writing systems tend to shape themselves with a similar mathematical structure, one good for the visual system. By understanding such principles, one can design new sets of stimuli more optimally processed by users.
   https://www.changizi.com/uploads/8/3/4/4/83445868/char.pdf

5. He was the first to show that it is possible to trick the visual system into carrying out arbitrary computations. While a bit arcane, this research is a testament to Mark's unique grasp of the innate capabilities of the human visual system.
   https://www.humanfactorylab.com/uploads/8/3/4/4/83445868/changizi_eyecomputer_presspiece.pdf

6. In 2001 he was the first to show that thirst can make a user have a fundamentally different visual perception. In particular, a thirsty user will more likely perceive an ambiguous stimulus (with a water and non-water interpretation) as being water.
   https://www.changizi.com/uploads/8/3/4/4/83445868/transp.pdf

7. He provided the first understanding of the process of getting bored, which is preceded by a short rise of liking beforehand. By comprehending this one can produce user experience pathways that are more engaging.
   https://www.changizi.com/uploads/8/3/4/4/83445868/preference.pdf

8. He and his lab have invented a variety of illusions which can even sense *you*, and modulate their perception depending on what you're doing.
   https://www.forbes.com/sites/markchangizi/2011/03/30/illusions-that-sense-you/#135bf1b25248

9. In 2014 he provided the first evidence that stimuli with “V”s inside them are associated more with danger than upside-down “V” stimuli. https://www.humanfactorylab.com/uploads/8/3/4/4/83445868/ecologicalwarnings.pdf

10. In 2009 he was the first to suggest several simple changes to hospital protocol that can allow clinical personnel to better detect cyanosis. https://www.humanfactorylab.com/uploads/8/3/4/4/83445868/colorclinical.pdf

11. Mark was the first to show that (a) there’s an optimum number of basic button types and number of hierarchical levels given the repertoire of functionality one wants for one’s software or language, and (b) for the English language itself, we seem to have the optimal hierarchy of words. By grasping such principles, one can design one’s interface to be a better fit for our human natural capability. https://www.humanfactorylab.com/optimaluxhierarchy.html

12. Mark’s most recent research concerns emotion-machine interfaces, and he possesses unique know-how on how to have one’s interface respond with emotionally intelligent behavior. This is the topic of his sixth book slated for 2021. https://www.humanfactorylab.com/emotion.html

13. Mark has a patent pending with Yamaha Motors on novel techniques for augmenting awareness of automobiles in the far periphery.

14. Mark patented the first passive filter that augments one’s ability to see oxygenation modulations under the skin, thereby allowing medical personnel to find veins more easily. See his startup http://vinOOptics.com. He also is at the forefront in understanding how those with color deficiency are effectively also health blind, something he talks about in this TED talk: https://www.youtube.com/watch?v=3MWl58r4ZBk&feature=youtu.be

15. He is the first to suggest a new variety of, and much richer, 3D experience for theaters. https://www.discovermagazine.com/technology/cheap-soul-teleportation-coming-soon-to-a-theater-near-you

16. He’s also the scientist behind the discovery that our pruney fingers are optimal human rain treads. Human factors is not just about perception and cognition! See his TED talk: https://www.youtube.com/watch?feature=player_embedded&v=k7ve_ibAY1s

Other examples from Mark’s research can be found at his Human Factory LLC (https://www.humanfactorylab.com/), and at his general research web site (http://www.changizi.com).