Casey Bennett, Ph.D.

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SUMMARY

Casey Bennett is an expert in Artificial Intelligence and Robotics in healthcare, with over 15 years' experience in data science, machine learning, and analytics. He has a PhD in informatics and computer science from Indiana University.

Dr. Bennett is currently an Associate Professor in the School of Intelligence Computing at Hanyang University in Seoul (Korea), and an adjunct professor at DePaul University in Chicago. He was formerly a data scientist at several major healthcare organizations: Cigna, CVS Health, and Centerstone Research Institute (CRI). At Centerstone, he led the development of the biggest mental health data warehouse and analytics platform in the world at the time, in addition to his many other accolades and scientific publications. He also been principal investigator and/or key personnel for studies funded by AHRQ, SAMHSA, NIH, NSF, the CDC, and NRF (Korea). More recently, he has served as the Chief Scientific Officer in healthcare startups, leading technical development of AI algorithms and clinical decision support tools for mental health, diabetes, and other chronic illnesses.

He has also taught computer science at Indiana University and DePaul University, and is currently working on robotic pets for therapeutic purposes with elderly patients as well as development of interactive robotic systems to study social cognition. His work has been featured as part of IBM's "Smarter Planet" campaign, as a TED talk, and in international magazines like ComputerWorld and Slate.

TECHNICAL SKILLS

Databases:	SQL, Oracle, Postgres, MySQL, MS SQL Server, MS Access, OLAP, ODBC/JDBC, Toad, SQL Plus, ETL Design and Implementation, Kettle
Programming:	Python, C/C++, Perl, Java, Visual Basic, PHP, HTML, XML, XSLT
Machine Learning:	Weka, Knime, Sci-Kit, TensorFlow, Keras, Clementine, NLTK toolkit, RapidMiner, BayesiaNet
Robotics:	Arduino, ROS (Robot operating system), Particle Photon, OpenCV (computer vision)
Big Data:	Hadoop, Hive, Apache Spark
Business Intelligence:	Jasper Reporting Engine, Pentaho Reporting Engine, Crystal Reports, Qlikview, Tableau, iReport
Statistics:	SPSS, SAS, R statistical software, SciPy
Genetic Software:	Mega, Phylip, DNAsp
Networks:	AWS, Cloud Environments, API development, Docker Systems, Cron Task Scheduling, LAN's, VPN, SSH, Virtual Machine Management, FTP file servers, Apache Tomcat
Platforms:	Windows, Mac, Linux/Unix
GIS:	ArcGIS, Quantum
Genetics:	Genetic sequence analysis, PCR (standard and real-time), Gel electrophoresis, primer design, microarrays, population genetics, phylogenetics

PROFESSIONAL EXPERIENCE

Hanyang University – Department of Intelligence Computing, Seoul, Korea
Associate Professor
April 2020-present

- Taught courses on data science, artificial intelligence, and machine learning in the Department of Intelligence Computing. Courses included Data Science Fundamentals, Machine Learning (graduate and undergraduate level), Intro to Data Science, AI Principles & Techniques, and Human-Robot Interaction. Led the Data Science Innovation Lab (DSIL). One of the top universities in Asia and the world (QS 2022 global rank #151)

DePaul University – College of Computing and Digital Media, Chicago, IL
Adjunct Professor
Dec 2018-present

- Taught courses on data science and machine learning in the College of Computing and Digital Media (CDM) at DePaul University. (QS 2022 national rank #111)

Cigna, Chicago, IL
Senior Data Scientist
Feb 2019-Mar 2020
- Focused on Value-Based Care initiatives ... how can we use data science to pay for quality in healthcare, rather than just service volume

CVS Health, Chicago, IL
Senior Data Scientist
Aug 2018-Feb 2019
- AI & Machine Learning group ... part of the broader Enterprise Analytics division. Worked on drug pricing optimization models to save $160 million.
- Served as expert on AI tools and technologies during vendor evaluation. Interviewed new hires for junior data scientist roles. Created content and ran internal learning series on machine learning techniques.

Raiven Healthcare, Chicago, IL
Chief Scientific Officer
July 2015-Aug 2018
- Artificial Intelligence and Robotics for healthcare purposes. Commercialization of several patents and technologies related to that, including AI-based clinical decision support to help patients and providers see personalized predictions ahead-of-time of the likely effects of various treatment options, and robotic companions for elderly people with chronic health conditions.
- Led teams developing software and hardware of sensor systems for monitoring in-home patient health, including algorithms for sensor fusion and machine learning prediction.

Indiana University – School of Informatics and Computing, Bloomington, IN
Associate Instructor
2011-2015
- Taught courses on robotics, human-robot interaction, health informatics, and machine learning in the School of Informatics and Computing (SOIC) at Indiana University. Managed team of 5 working on robotic face prototype.

Centerstone Research Institute, Nashville, TN
Data Scientist
2006-2015
- Led development and deployment of innovative data-driven clinical technologies. Data Science, Data Warehousing, Data Mining, Machine Learning, Clinical Decision Support, Clinical Productivity Systems, Statistical Analysis, Healthcare Contract Modeling, Academic Publications, Reporting/Business Intelligence, ETL/SQL.
- Grew a team of 2 (when I arrived) into a world-class Analytics department of 20 staff during my time there.

Indiana University - Indiana Molecular Biology Institute, Bloomington, IN
Database Designer
2003-2005
- Data Warehousing of genetic data. Development of genetic analysis and bioinformatics software.

EDUCATION

Indiana University, Bloomington IN   2015
- Ph.D. – Informatics & Computer Science
- Biomedical Informatics/Artificial Intelligence
- Dissertation: *Robotic Faces: Exploring Dynamical Patterns of Social Interaction between Humans and Robots*

Indiana University, Bloomington IN   2005
- M.A. - Biological Anthropology

Western Kentucky University, Bowling Green, KY 2003
- B.A. – Biological Anthropology

HONORS & PROFESSIONAL MEMBERSHIPS

1999-2003	Award of Excellence Scholarship, Western Kentucky University
2003	Magna Cum Laude, Western Kentucky University
2004-2005	Fellow at the Center for the Study of Global Change, Indiana University
2006-Present	Member, The Data Warehousing Institute (TDWI)
2010	TDWI Best Practices Award, The Data Warehousing Institute, www.tdwi.org
2010	CARF "Exemplary" Status for Clinical Analytics, Commission on Accreditation of Rehabilitation Facilities, www.carf.org
2010- 2012	Work featured in IBM's "Smarter Planet" Campaign
2010-Present	Member, American Medical Informatics Association (AMIA)
2013-2015	NSF IGERT Associate – Cognitive Science, Indiana University
2013-2014	Summer Research Award – NSF IGERT Program, Cognitive Science, Indiana University
2014-Present	Institute of Electrical and Electronics Engineers (IEEE)
2018-Present	Association for Computing Machinery (ACM)
2021-Present	Founder & Director, DSKUS International Data Science Exchange Program

PROFESSIONAL SERVICE

Reviewer	International Journal of Medical Informatics (IJMI)
Reviewer	Journal of Biomedical Informatics (JBI)
Reviewer	American Medical Informatics Association (AMIA) Conference
Reviewer	Artificial Intelligence in Medicine (AIIM)
Reviewer	BMC Medical Informatics and Decision Making
Reviewer	International Journal of Social Robotics (IJSR)
Reviewer	ACM Conference on Human-Robot Interaction (HRI)
Reviewer	Human Biology
Reviewer	Interaction Studies
Reviewer	Journal of Affective Disorders
Advisory Board	Chicago AI Days
Associate Editor	IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)
Review Editor	Frontiers in Robotics and AI

SELECTED PUBLICATIONS

1. Bennett CC, Ross MK, Baek Y, Kim D, and AD Leow (2022) "Smartphone Accelerometer Data as a Proxy for Clinical Data in Modeling of Bipolar Disorder Symptom Trajectory." *Nature Digital Medicine*. 5: 181.

2. Bennett CC, Stanojevic C, Kim S, Sabanovic S, Piatt JA, Lee J et al. (2022) "Comparison of in-home robotic companion pet use in South Korea and the United States: A case study." *9th IEEE International Conference on Biomedical Robotics & Biomechatronics (BIOROB)*. pp.1-7.

3. Bennett CC, Ross MK, Baek Y, Kim D, and AD Leow (2022) "Predicting clinically relevant changes in bipolar disorder outside the clinic walls based on pervasive technology interactions." *Pervasive and Mobile Computing*. 83: 101598.

4. Bennett CC and B Weiss (2022) Purposeful failures as a form of culturally-appropriate intelligent disobedience during human-robot social interaction. *Autonomous Agents and Multiagent Systems (AAMAS 2022): Best and Visionary Papers*. pp. 84-90. doi.org/10.1007/978-3-031-20179-0_5

5. Bennett CC, Weiss B, Suh J, et al. (2022) "Exploring data-driven components of socially intelligent AI through cooperative game paradigms." *Multimodal Technologies and Interaction*. 6(2): 16.

6. Bennett CC, Stanojevic C, Sabanovic S, Piatt JA, and S Kim. (2021) "When no one is watching: Ecological momentary assessment to understand situated social robot use in healthcare." *ACM Conference on Human-Agent Interaction (HAI)*. Nagoya, Japan. pp. 245-251.

7. Bennett CC (2021) "Evoking an intentional stance during human-agent social interaction: Appearances can be deceiving." *IEEE International Symposium on Robot and Human interactive Communication (RO-MAN)*. Vancouver, Canada. pp.362-368.

8. Vesel C et al. (2020) "Effects of mood and aging on keystroke dynamics metadata and their diurnal patterns in a large open-science sample: A BiAffect iOS study." *Journal of the American Medical Informatics Association*. 27(7): 1007-1018.

9. Raj RK, Parrish A, Impagliazzo J, Romanowski, CJ, Ahmed SA, Bennett CC, et al. (2019) "Data science education: Global perspectives and convergence. *ACM Conference on Innovation and Technology in Computer Science Education (ITICSE)*. pp. 265-266.

10. Randall NP, Bennett CC, Sabanovic S, et al. (2019) "More than just friends: in-home use and design recommendations for sensing socially assistive robots (SARs) by older adults with depression." *Paladyn Journal of Behavioral Robotics*. 10(1): 237-255.

11. Bennett CC, Sabanovic S, Piatt JA, et al. (2017) "A robot a day keeps the blues away." *IEEE International Conference on Health Informatics (ICHI)*. Park City, Utah, USA. pp. 536-540.

12. Bennett CC and TW Doub (2016) "Expert systems in mental healthcare: AI applications in decision making and consultation." In: David D. Luxton (ed.) *Artificial Intelligence in Mental Healthcare*. Elsevier Press. pp. 27-51.

13. Bennett CC and S Sabanovic (2015) "The effects of culture and context on perceptions of robotic facial expressions." *Interaction Studies*. 16(2): 272-302.

14. Bennett CC and S Sabanovic (2014) "Deriving minimal features for human-like facial expressions in robotic faces." *International Journal of Social Robotics*. 6(3): 367-381.

15. Bennett CC and TW Doub (2014) "Temporal modeling in clinical artificial intelligence, decision-making, and cognitive computing: Empirical exploration of practical challenges." *Proceedings of the 3rd SIAM Workshop on Data Mining for Medicine and Healthcare (DMMH)*. Philadelphia, PA, USA.

16. Sabanovic S, CC Bennett, J Piatt, et al. (2014) "Participatory design of socially assistive robots for preventive patient-centered healthcare." *IEEE IROS Workshop on Assistive Robotics for Individuals with Disabilities*. Chicago, IL, USA.

17. Sabanovic S, Bennett CC, Chang WL, and L Huber (2013) "PARO robot affects diverse interaction modalities in group sensory therapy for older adults with dementia." *Proceedings of the 13th International Conference on Rehabilitation Robotics (ICORR)*. Seattle, Washington. pp. 1-6. PMID: 24187245.

18. Bennett CC and K Hauser (2013) "Artificial intelligence framework for simulating clinical decision-making: A Markov decision process approach." *Artificial Intelligence in Medicine*. 57(1): 9-19. PMID: 23287490

19. Bennett CC (2012) "Utilizing RxNorm to support practical computing applications: Capturing medication history in live electronic health records." *Journal of Biomedical Informatics*. 45(4): 634-641. PMID: 22426081

20. Bennett CC, Doub TW, and R Selove (2012) "EHRs connect research and practice: Where predictive modeling, artificial intelligence, and clinical decision support intersect." *Health Policy and Technology*. 1(2): 105-114.

21. Bennett, CC, Doub, TW, Bragg, AD, et al. (2011) "Data mining session-based patient reported outcomes (PROs) in a mental health setting: Toward data-driven clinical decision support and personalized treatment." *Proceedings of the IEEE Health Informatics and Systems Biology Conference*. pp. 229-236.

22. Bennett, CC and TW Doub (2010) "Data mining and electronic health records: Selecting optimal clinical treatments in practice." *Proceedings of the 6th International Conference on Data Mining*. pp. 313-318.

SELECTED RESEARCH SUPPORT

Ongoing

(Bennett)   10/1/2021-12/31/2023
US State Department (USA)
Forging Strategic Data Science & AI Partnerships between Korea and the US
The project seeks to develop an innovative "data science exchange" program to better align future scientists and public policy makers in Korea and the United States. Program includes Samsung, Hyundai Robotics, Coupang, Google, Microsoft, IBM, and other companies. The aim is to expose students to how data science works on a global scale, and to see how data science skills can apply real-world international policy challenges.
Role: Principal Investigator. $280,000, 20% effort

(Bennett)   3/1/2021-2/28/2024
National Research Foundation (Korea)
Exploring Social Cognition through Human-Robot Interaction to Develop Better Interactive AI Devices
The goal of this project is to use human-robot interaction (HRI) experiments to develop a better understanding of human social cognition, to understand the "features" of a social interaction that trigger recognition they are interacting with an intelligent agent, versus a machine, to create more "life-like" interactive AI in the future.
Role: Principal Investigator. ₩94,036,320 krw, 20% effort (approx. $86,000 USD)

(Bennett)   9/30/2020-3/31/2022
Hanyang University, National Research Foundation (Korea)
Evaluating the Use of EMA and Sensors on Socially-Assistive Robots for In-Home Patient Health Activity Tracking
The purpose of the study is to investigate how sensor data from robots can be used to track patient activity, robot interaction, and environmental factors in patient homes to monitor their health. In particular, the focus is on evaluating use of ecological momentary assessment (EMA) to collect robot interaction data.
Role: Principal Investigator. ₩20,000,000 krw, 20% effort (approx. $18,000 USD)

(Bethel/Sabanovic)   10/1/2019-12/31/2023
National Science Foundation (USA)
CHS Large: Participatory Design and Evaluation of Socially Assistive Robots for
Use in Mental Health Services in Clinics and Patient Homes
Large multi-site study of developing and using robotic dogs for therapy with children who have chronic illnesses. Project is a collaboration across multiple leading research institutions.
Role: Key Personnel. $1,232,000, 10% effort

Completed

(Sabanovic/Piatt)   3/15/2016-9/25/2017
FRSP Award, Indiana University
Preliminary Study of Socially Assistive Robotic Technologies for Sustaining Independent Living in Older Adults with Chronic Depression and Co-Occurring Physical Illness
The primary purpose of the award is to pilot test socially assistive robotic technologies as a therapeutic tool in homes of older adults with depression. The goal is to see if such robots can decrease the symptoms of depression, and whether sensor data from the robots about interaction patterns with those humans can be used to predict future changes in depression levels.
Role: Key Personnel

(Sabanovic)   5/1/2014-4/30/2016
Core PHIT Award (via NIH), Indiana University
Participatory Design of Assistive Robotic Technologies to Sustain Independent Living in Older Adults with Chronic Depression
The primary purpose of the award is to produce preliminary research on how socially assistive robotic technologies can be incorporated into the lives of older adults with depression to help them age in place. A secondary goal is to explore how participatory design methods can be used with this population.
Role: Key Personnel

(Sabanovic)   8/1/2011-7/31/2014
National Science Foundation - Division of Information & Intelligent Systems
EAGER: Cultural models in social robotics - Comparative studies with users in the US and Japan
This project evaluates the use of robots (Paro) for therapeutic purposes in assisted living facilities, while exploring the differences in how users perceive, make sense of, and interact with social robots across cultures.
Role: Data Scientist

TI018870 (Blakely/Hardy)   9/30/2007-9/29/2013
SAMHSA – Center for Substance Abuse Treatment
Targeted Capacity – Co-Occurring Disorders Treatment and HIV/AIDS Services
This project is expanding and enhancing access to integrated dual disorders treatment for individuals who are released from prisons and jails who are abusing substance and at-risk for HIV/AIDS.
Role: Database Implementation

(Trivedi, Daly, Doub)   10/01/2007 – 09/30/2010
Agency for Healthcare Research and Quality
Using Information Technology to Provide Measurement Based Care for Chronic Illness
This project is testing implementation of measurement based care (MBC) in an ambulatory care setting with an integrated clinical decision support system (CDSS) and an electronic health record (EHR-CDSS), to improve depression care.
Role: Data Scientist

(Bennett)   1/01/2010-12/31/2010
Funding: Ayers Foundation; Centerstone of Tennessee, Centerstone of Indiana
Practice-Based Evidence Outcomes Pilot Study – CDOI
Implementation and analysis of the effects of a client-directed clinical outcome measure in Tennessee and Indiana.
Role: Principal Investigator

(Bennett)   6/01/2008-6/01/2009
Funding: Ayers Foundation
Clinical Productivity System – A Decision Support Model (2009) – Designed and implemented a clinical productivity system designed on a decision support model. Increased revenues by 30%, treatment plan completion 25%, case management eligibility 20%, clinical percentage 10%, as well as improvements in compliance issues and outcomes collections.
Role: Principal Investigator

SM-56910 (Doub, Moran)   10/01/2004 – 09/30/2007
SAMHSA – Center for Mental Health Services
Implementation of the IMPACT Model to Treat Depression in Older Adults
This project evaluates the effectiveness of the IMPACT model, for mental health outreach, treatment, and prevention services in a primary care setting for older adults in Davidson and Williamson Counties.
Role: Lead Data Architect

GRADUATE STUDENT SUPERVISION (recent)

- Jae Young Suh, Hanyang University, Master's Student (*grad. Fall 2021*)
- Seongcheol Kim, Hanyang University, Master's Student (*grad. Spring 2022*)
- Jinjae Lee, Hanyang University, Master's Student (*grad. Fall 2022*)
- YoungHo Bae, Hanyang University, Master's Student (*exp. 2023*)
- Jun Hyung Yun, Hanyang University, Master's Student (*exp. 2023*)
- Hansae Cho, Hanyang University, Master's student (*exp. 2023*)

REFERENCES

- Dr. Selma Sabanovic, Associate Professor, Indiana University, selmas@indiana.edu
- Dr. Tom Doub, Assistant Professor, Vanderbilt University Medical Center, doubtw@gmail.com
- Dr. Alex Leow, Professor, University of Illinois, weihliao@uic.edu
- Dr. Jen Piatt, Associate Professor, Indiana University, jenpiatt@indiana.edu
- Dr. Kay Connelly, Professor & Associate Dean, Indiana University, connelly@indiana.edu