

# 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 a Senior Data Scientist at CVS Health, and an adjunct Professor of Data Science at DePaul University. Previously, he was the original data scientist at Centerstone, the largest clinic-based behavioral healthcare provider in the United States, going back to 2006. 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 served as technical data lead for studies funded by AHRQ, SAMHSA, NIH, NSF, and the CDC. More recently, he has served as the Chief Scientific Officer at Raiven Healthcare, leading technical development of AI algorithms and clinical decision support tools for mental health, diabetes, and other chronic illnesses in both payor and at-risk provider systems.

He has also taught computer science at Indiana University and DePaul University, and led teams developing hardware and software for robotic sensor systems for monitoring in-home patient health, including sensor fusion and machine learning prediction. 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

### **CVS Health, Chicago, IL**

#### **Senior Data Scientist**

##### **Aug 2018-present**

- Artificial Intelligence and Machine Learning (AI/ML) Group. Recruited in to help build this newly formed team within Enterprise Analytics.

### **Depaul University – College of Computing and Digital Media, Chicago, IL**

#### **Adjunct Professor**

##### **Dec 2018-present**

- Taught courses on data science, artificial intelligence, and machine learning in the College of Computing and Digital Media (CDM) at DePaul University.

**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.

**Inviva, Louisville, KY**  
**Data Analyst**  
**2005-2006**

- Data Warehousing, Data Mining, Statistical Analysis, Automated Reporting Needs

**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](http://www.tdwi.org)

2010	CARF “Exemplary” Status for Clinical Analytics, Commission on Accreditation of Rehabilitation Facilities, <a href="http://www.carf.org">www.carf.org</a>
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)

### **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	Applied Clinical Informatics
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

### **SELECTED PUBLICATIONS**

1. 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.
2. 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.
3. Bennett CC and S Sabanovic (2015) “The effects of culture and context on perceptions of robotic facial expressions.” *Interaction Studies*. 16(2): 272-302.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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
9. 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

10. 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.
11. 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.
12. Bennett, CC (2011) "Clinical productivity system: A decision support model." *International Journal of Productivity and Performance Management*. 60(3): 311-319.
13. 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 INVITED TALKS**

1. Takeda Digital Health Summit (2018) "Driving Analytics with Artificial Intelligence"
2. Connected Health Conference (2018) "Bots for Socialization and Care Delivery: Exploring the Limits of Bot-Human Interaction"
3. Matter Chicago (2018) "Artificial Intelligence Approaches for Mental Health"
4. Cohen's Veteran Network (2017) "Meaningful Data"
5. Nashville Tech Council Analytics Summit (2016) "Artificial Intelligence in Healthcare: Predictive Analytics Tools for a Pay-for-Performance World"
6. TEDxNashville (2016) "Artificial Intelligence in Healthcare: It's about Time"  
(<https://www.youtube.com/watch?v=3LkbUxqGTfo>)

### **SELECTED RESEARCH SUPPORT**

(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). The proposal focuses on the use of MBC to improve the quality of care for patients with major depressive disorder (MDD).  
 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
- TI17232 (Outlaw) 08/15/2005-08/14/2008  
 SAMHSA – Center for Substance Abuse Treatment  
**TCE Rural Populations: Methamphetamine Evidence-based Treatment & Healing (METH)**  
 This program targeted adults ages 18+ who are abusing methamphetamine and other emerging drugs in six rural counties. Utilizing the Matrix Model, support services (outreach, assessment, case management), and community education, the Rural METH Initiative expanded access to structured, culturally competent care.  
 Role: Lead Data Architect
- 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

## REFERENCES

- Dr. Selma Sabanovic, Associate Professor, Indiana University, [selmas@indiana.edu](mailto:selmas@indiana.edu)
- Dr. Tom Doub, Chief Clinical Officer, American Addictions Centers, [doubtw@gmail.com](mailto:doubtw@gmail.com)
- Dr. Kay Connelly, Professor & Associate Dean, Indiana University, [connelly@indiana.edu](mailto:connelly@indiana.edu)
- Dr. Dennis Morrison, Chief Clinical Officer, Netsmart, [dmorrisonphd@gmail.com](mailto:dmorrisonphd@gmail.com)