COREY WELLS ARNOLD
Curriculum Vitae

PERSONAL DATA

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EDUCATION

2002	BS	Biomedical Engineering/Computer Science, University of Wisconsin, Madison
2005	MSc	Biomedical Engineering, University of California, Los Angeles
2009	PhD	Information Science, University of California, Los Angeles

PROFESSIONAL EXPERIENCE

2000	Research Intern, Institute of Human Genetics, University of Minnesota, Twin Cities
2003	Programmer Analyst, Department of Biostatistics, Washington University in St. Louis
2003-2007	National Library of Medicine Fellow, UCLA NLM Medical Imaging & Informatics Training Program
2006	Visiting Scholar, Lister Hill National Center for Biomedical Communications, National Institutes of Health
2008	Research Intern, IBM Almaden Research Center, San Jose, CA
2009-2010	Assistant Professional Researcher, Department of Radiological Sciences, UCLA
2009-2011	Research Scientist, Department of Radiology, VA Greater Los Angeles Healthcare System
2010-2017	Assistant Professor, Department of Radiological Sciences, UCLA
2010-2018	Affiliate Faculty, Department of Bioengineering, UCLA School of Engineering
2014-Present	Member, Institute for Quantitative and Computational Biology (QCBio), UCLA
2017-2021	Associate Professor, Department of Radiological Sciences, UCLA
2017-2021	Associate Professor, Department of Pathology & Laboratory Medicine, UCLA (joint)
2018-2021	Associate Professor, Department of Bioengineering, UCLA (joint)
2019-2021	Associate Professor, Bioinformatics Interdepartmental Program, UCLA (core faculty)
2020-2021	Associate Professor, Department of Electrical & Computer Engineering, UCLA (joint)
2021-Present	Professor, Department of Radiological Sciences, UCLA
2021-Present	Professor, Department of Pathology & Laboratory Medicine, UCLA (joint)
2021-Present	Professor, Department of Bioengineering, UCLA (joint)
2021-Present	Professor, Bioinformatics Interdepartmental Program, UCLA (core faculty)
2021-Present	Professor, Department of Electrical & Computer Engineering, UCLA (joint)
2021-Present	Field Chair, Biomedical Data Sciences, Department of Bioengineering, UCLA
2022-Present	Vice Chair of Research, Department of Radiological Sciences, UCLA

AWARDS AND HONORS

2007-2008	UCLA Regents Stipend
2007-2008	UCLA Graduate Student Summer Research Mentorship
2008-2009	UCLA Chancellor's Dissertation Year Fellow
2013	Distinguished Poster Award, International Medical Informatics Association MEDINFO conference
2021	Outstanding Basic Science Faculty Teaching Award, Department of Radiological Sciences, UCLA

PROFESSIONAL ACTIVITIES

<u>Memberships</u>

2007-Present	Member, American Medical Informatics Association (AMIA)
2011-Present	Member, Association for Computing Machinery (ACM)

<u>Committees</u>

2015-2018	Student Paper Competition Committee, American Medical Informatics Association Annual Symposium
2016	Program Committee, International Conference on Pattern Recognition Workshop on Pattern Recognition for Healthcare Analytics

<u>Editorial Services</u>

2008-Present	Reviewer, Journal of the American Medical Informatics Association
2010-Present	Reviewer, Computers in Biology and Medicine
2011-Present	Reviewer, Journal of Biomedical Informatics
2015-Present	Reviewer, Journal of Applied Clinical Informatics
2016-Present	Reviewer, Expert Systems with Applications
2016-Present	Reviewer, PLOS ONE
2018-Present	Reviewer, Journal of the American Medical Informatics Association OPEN
2018-Present	Reviewer, Journal of Medical Systems
2019-Present	Reviewer, Journal of the National Cancer Institute
2022-Present	Reviewer, Nature Communications
2022-Present	Reviewer, Nature Medicine
2022-Present	Reviewer, Stroke
2023-Present	Reviewer, Circulation

<u>Grant Review</u>

2014	German Federal Ministry of Education and Research, Reviewer
2014-Present	UCLA Clinical and Translational Science Institute, Reviewer, Reviewer
2016	NIH Study Section, Special emphasis panel ZRG1 HDM-Z (03) M, Reviewer
2017	NIH Study Section, Biomedical Computing and Health Informatics (BCHI), Reviewer
2017	NIH Study Section, Multi-scale Modeling Program ZEB1 OSR-C (J2) S, Reviewer
2018	NIH Study Section, Urologic P20 Applications ZDK1 GRB-M (O5), Reviewer
2019	NIH Study Section, Small Business: Disease Prevention and Management, Risk Reduction and Health Behavior change ZRG1 RPHB-Z (10) B, Reviewer
2019	Canada Foundation for Innovation Award internal review, University of British Columbia, Vancouver Canada, Reviewer
2019	NIH Study Section, Urologic and Urogynecologic Applications ZRG1 DKUS-B (90), Reviewer
2019	Dutch Research Council Domain Applied and Engineering Sciences, Reviewer
2022	NIH Study Section, Small Business: Disease Prevention and Management, Risk Reduction and Health Behavior change ZRG1 RPHB-Z(10), Reviewer
2022	Health and Medical Research Fund from The Government of the Hong Kong Special Administrative Region (HKSAR), Reviewer

COURSES TAUGHT

2009-Present	Bioengineering 224B: Advances in Imaging Informatics, UCLA (Course Co-Director)
2009-Present	Bioengineering 223: Programming Lab for Informatics, UCLA (Course Director)
2009-Present	Bioengineering 220: Introduction to Biomedical Informatics, UCLA (Guest Lecturer)
2018-2019	HDS 200A: Health Analytics: Identifying, Collecting, and Analyzing Big Data in Healthcare, Cedars-Sinai (Guest Lecturer)
2013-2017	Health Policy and Management 441: Health Analytics: Identifying, Collecting, and Analyzing Big Data in Healthcare, UCLA (Guest Lecturer)
2013-2015	Clinical and Translational Science Institute Module 6: Seminar on Biomedical Informatics, UCLA K30 Training Program (Course Co-Director)

UCLA SERVICE

2012	Member, UCLA Research Informatics Planning Committee (RISP)
2013-Present	Member, UCLA Clinical and Translational Science Institute Scientific Advisory Committee

2017-2019   Member, UCLA Undergraduate Research Scholarship Program Review Committee
2017-2019   Member, UCLA Undergraduate Research Fellows Program Review Committee
2018-2022   Member, UCLA Intercollegiate Athletics Committee
2021-Present Member, UCLA Radiology Committee on Academic Merits and Promotions
2021-Present Co-chair, UCLA Radiology AI Working Group
2022-Present Member, UCLA Radiology Practice Group Executive Committee

RESEARCH GRANTS

Title	**Hypothalamic Amenorrhea as a Fertility Status Marker for Cardiovascular Health (R01 HD106096)**
Dates	September 1, 2021 – July 31, 2025
Source/Institution	NIH/NICHD, Eunice Kennedy Shriver National Institute of Child Health & Human Development
Principal Investigator	Chrisandra Shufelt, MD
Direct Costs	$151,000
Role(s)	Site PI

Hypothalamic amenorrhea (HA) occurs during reproductive years and results in ovulatory dysfunction, anovulation and infertility which can be prolonged from months to years and is characterized by varying combinations of psychosocial stress, anxiety, high levels of physical activity and/or weight loss. Data from our group indicates that one-third of women with HA (mean age: 27 yrs) have preclinical CVD measured noninvasively as vascular dysfunction and vascular inflammation. Our application will study HA as a marker of fertility status for cardiovascular health and perform dense-phenotyping using remote patient monitoring and patient reported outcomes to determine which HA phenotype are related to preclinical CVD and inflammation and expand our analyses to a large population cohort with 30-year CVD risk factors and CVD event follow-up.

Title	**Predicting the Presence of Clinically Significant Thyroid Cancer using Ultrasound Imaging (R21 EB030691)**
Dates	June 4, 2021 – March 31, 2024
Source/Institution	NIH/NIBIB, National Institute of Biomedical Imaging and Bioengineering
Principal Investigator	William Speier, PhD
Direct Costs	$400,000
Role(s)	Investigator

Medical image analysis plays an important role in computer aided detection and diagnosis, but usually focuses on individual images in isolation. Graph convolutional networks have the ability to utilize the relationships between images in a study to aggregate information and make a more accurate evaluation. The focus of this project is to implement a graph-based approach for distinguishing indolent from aggressive thyroid cancer, thus preventing patients from receiving unnecessary treatment and incurring associated negative functional outcomes.

Title	**A Machine Learning Approach to Classifying Time Since Stroke using Medical Imaging (R01 NS100806)**
Dates	May 1, 2018 – February 28, 2023
Source/Institution	NIH/NINDS, National Institute of Neurological Disorders and Stroke
Principal Investigator	Corey Arnold, PhD
Direct Costs	$1,943,542
Role(s)	PI

Stroke is a leading cause of death in the United States, with approximately 795,000 Americans experiencing a new or recur-rent stroke each year. However, patients who present with an unknown stroke onset time are ineligible for receiving the leading therapy. The focus of this research is to develop a novel machine learning method for classifying stroke onset time from imaging, enabling treatment for a new cohort of patients and potentially saving them from severe morbidity or mortality.

Title	**mHealth for Heart Failure: Predictive Models of Readmission Risk and Self-care Using Consumer Activity Trackers (R01 HL141773)**
Dates	April 5, 2019 – February 28, 2023
Source/Institution	NIH/NHLBI, National Heart, Lung, and Blood Institute
Principal Investigator	Corey Arnold, PhD
Direct Costs	$1,911,676

Heart failure (HF) is a debilitating disease that affects over five million people in the United States and in 2012 had a direct cost of over $30.7 billion annually. Home monitoring of HF patients has the potential to reduce costs and improve quality of life by reducing preventable hospital readmissions. The goals of this R01 are to: 1) demonstrate that patients are adherent to a home monitoring regimen when using minimally-invasive monitoring technologies; 2) combine the minimally-invasive home monitoring regimen with predictive algorithms to forecast hospital readmission; 3) develop models using electronic health record (EHR) data and a baseline survey to predict levels of adherence to the home monitoring regimen; and 4) explore the pragmatic feasibility of using a mobile app for communicating with patients in prospective pilot study.

Title	**UCLA Clinical and Translational Science Institute (UL1 TR001881; TL1 TR001883)**
Dates	September 1, 2016 – August 31, 2021
Source/Institution	NIH/NCATS, National Center for Advancing Translational Sciences
Principal Investigator	Steven Dubinett, MD
Direct Costs	$69,600,000
Role(s)	Investigator

In the continuance of UCLA's Clinical Translational Science Award (CTSA), efforts continue to further develop advanced infrastructure for translational. Its mission is to bring biomedical innovations to bear on the greatest health needs of Los Angeles – the largest and one of the most ethnically, socially and economically diverse counties in the United States. The CTSI has five aims: 1) prepare the translational workforce to conduct high-quality, multidisciplinary team science; 2) engage stakeholder communities in clinical and translational research and disseminate successful models of collaboration; 3) integrate special populations, especially those experiencing health disparities, into research; 4) improve methods and processes to accelerate scientific translation, overcome key roadblocks and support multisite research; and 5) provide informatics solutions to operational and scientific roadblocks to advance high-impact translational science within the UCLA CTSI and the CTSA network.

Title	**Predicting the Presence of Clinically Significant Prostate Cancer using Multiparametric MRI and MR-US Fusion Biopsy (R21 CA220352)**
Dates	June 1, 2018 – May 31, 2021
Source/Institution	NIH/NCI, National Cancer Institute
Principal Investigator	Corey Arnold, PhD
Direct Costs	$275,000
Role(s)	PI

The research objective of this R21 is to develop novel techniques using multiparametric magnetic resonance imaging (mp-MRI) and MRI-ultrasound (US) fusion guided biopsy data that provide discriminatory power in distinguishing indolent versus clinically significant prostatic adenocarcinoma based on non-invasive imaging. We propose to implement deep learning models for clinical prostate mp-MRI sequences to generate new quantitative imaging features representative underlying tissue. Our models will accommodate ground truth labels from pathology whole mount specimens, as well as MRI-US fusion biopsy results. Model features will be used to predict voxel-level cancer suspicion, thereby enabling a novel method for performing "imaging biopsies." Finally, voxel-level suspicion maps will be aggregated into patient-level quantitative imaging biomarkers and combined with clinical data to create a multimodal nomogram for performing risk stratification.

Title	**The Los Angeles PRISMS Center: The Biomedical Real-Time Health Evaluation (BREATHE) Platform (U54 EB022002)**
Dates	September 30, 2015 – June 30, 2021
Source/Institution	NIH/NIBIB, National Institute of Biomedical Imaging and Bioengineering
Principal Investigator	Alex Bui, PhD
Direct Costs	$4,719,671
Role(s)	Investigator

The Los Angeles (LA) PRISMS Center aims to be the leader in the development and application of mobile health (mHealth) technologies that deepen our scientific understanding and clinical management of pediatric conditions. Bringing together leading experts from UCLA and USC in biomedical informatics, computer science, wireless health, environmental science and health, and pediatrics, this Center proposes creation of an innovative end-to-end software infrastructure for pediatric sensor-based health monitoring.

Title	**Medical Imaging Informatics Training Grant (T32 EB016640)**
Dates	September 1, 2013 – August 31, 2023
Source/Institution	NIH/NIBIB, National Institute of Biomedical Imaging and Bioengineering
Principal Investigator	Alex Bui, PhD
Direct Costs	$830,825
Role(s)	Investigator

This T32 training grant continues the imaging informatics graduate student program that originated with a T15 from the National Library of Medicine. With the now ubiquitous usage of imaging as an in vivo method for objectively documenting and elucidating disease and the human condition, novel research challenges arise in the acquisition, the understanding, and the usage of imaging and related (clinical) data to realize new knowledge and improved health outcomes.

Title	**Machine Learning Tools to Diagnose Prostate Cancer in Multi-parametric MR and Whole Slide Imaging (P50 CA092131)**
Dates	September 1, 2017 – August 31, 2019
Source/Institution	NIH/NCI, National Cancer Institute
Principal Investigator	Robert Reiter, MD
Direct Costs	$50,000
Role(s)	PI (Institutional sub-award)

The research objective of this project is to develop novel machine learning techniques to more accurately diagnose prostate cancer using multiparametric magnetic resonance imaging (mp-MRI) data, MRI-ultrasound (US) fusion guided biopsy data, and whole slide imaging (WSI) pathology data. We propose to implement a multi-instance learning (MIL) based convolutional neural network (CNN) model for clinical prostate mp-MRI sequences to generate new quantitative imaging features representative of the underlying tissue. Hierarchical CNN features will be used to predict voxel-level Gleason scores, thereby enabling a novel method for performing "imaging biopsy," with the ultimate goal of providing discriminatory power in distinguishing indolent versus clinically significant prostatic adenocarcinoma based on non-invasive imaging. We will similarly develop deep learning image analysis tools for prostate cancer WSI that enable the repeatable quantification of cancer heterogeneity from histopathology. These tools may assist pathologists in cancer detection and reporting. Ultimately, the combination of discovered imaging and pathology features will allow for a more precise diagnosis of prostate cancer, which in further studies may be correlated with prognosis, treatment response, and outcome.

Title	**mHealth for Heart Failure: Predictive Models of Readmission Risk and Self-care Using Consumer Activity Trackers (R56 HL135425)**
Dates	September 1, 2017 – August 31, 2019
Source/Institution	NIH/NHLBI, National Heart, Lung, and Blood Institute

Principal Investigator   Corey Arnold, PhD
Direct Costs $394,966
Role(s)   PI

Heart failure (HF) is a debilitating disease that affects over five million people in the United States and in 2012 had a direct cost of over $30.7 billion annually. Home monitoring of HF patients has the potential to reduce costs and improve quality of life by reducing preventable hospital readmissions. The goal of this one-year R56 pilot study of 25 subjects is to demonstrate that patients are adherent with home monitoring regimens when using minimally invasive monitoring technologies, and that a minimally-invasive home monitoring regimen combined with novel predictive algorithms may be used to forecast hospital readmission.

Title   **Remote Monitoring to Predict Heart Failure**
Dates   November 1, 2016 – August 31, 2018
Source/Institution   California Institute to Advance Precision Medicine
Principal Investigator   Brennan Spiegel, MD
Direct Costs $1,200,000
Role(s)   Investigator

This project will look for the earliest signs of cardiovascular disease by monitoring patients remotely with a consumer fitness tracker that measures activity, sleep, heart rate and stress level. Participants in the study also will report their levels of anxiety, depression and quality of life using a smartphone or computer. Additionally, patients will send researchers finger-prick blood samples by mail, allowing doctors to assess a variety of biomarkers and measure more than 500 blood proteins.

Title   **A Predictive Prognostic Model for Glioblastoma Multiforme (R01 CA1575533)**
Dates   June 1, 2012 – May 31, 2018
Source/Institution   NIH/NCI, National Cancer Institute
Principal Investigator   Alex Bui, PhD
Direct Costs $7,753,684
Role(s)   Investigator

This research effort looks to validate a Bayesian belief network (BBN) developed using two NIH datasets: the National Cancer Institute (NCI) Rembrandt Project; and the Cancer Genome Atlas (TCGA). Model variables will encompass the full spectrum of available observations (demographics, initial presentation, histopathology, treatment, imaging, performance scores, end outcomes, etc.).

Title   **A Topic Model and Visualization for Automatic Summarization of Patient Records (R21 LM011937)**
Dates   September 1, 2014 – August 31, 2017
Source/Institution   NIH/NLM, National Library of Medicine
Principal Investigator   Corey Arnold, PhD
Direct Costs $275,000
Role(s)   PI

The focus of this research proposal is the development of an automatic summarization system to expedite the review of a patient's medical history. Two specific aims guide the proposed work: 1) to create a topic model of free-text clinical documents that integrates contextual patient- and document-level data, and discovers multi-word concepts; and 2) to utilize the proposed model to drive a web application that includes concept-, source-, and time-oriented views for automatically summarizing patient records.

Title   **Adapting the Hope Social Media Intervention to Reduce Prescription Drug Abuse**

	(R21 DA039458)
Dates	September 1, 2014 – August 31, 2017
Source/Institution	NIH/NIDA, National Institute on Drug Abuse
Principal Investigator	Sean Young, PhD
Direct Costs	$275,000
Role(s)	Investigator

This proposal seeks to determine the feasibility, acceptability, and preliminary effectiveness of applying the Harnessing Online Peer Education (HOPE) intervention, or peer support social media community model, to reduce prescription drug abuse among chronic opioid non-cancer pain patients. The HOPE intervention is an evidenced-based peer-led social media intervention provided over Facebook that has been successfully used to change health behaviors.

Title	**An Observational Acute Stroke Model for Decision Support and Comparing Outcomes** **(R01 NS076534)**
Dates	September 1, 2011 – August 31, 2017
Source/Institution	NIH/NINDS, National Institute of Neurological Disorders and Stroke
Principal Investigator	Alex Bui, PhD/Gary Duckwiler, MD
Direct Costs	$1,789,952
Role(s)	Investigator

This proposal focuses on the creation of an observational database that is subsequently used to support an influence diagram for acute stroke treatment. The database is predicated on the specification of a unified information model for stroke and its treatment.

Title	**RUMI: A Patient Portal for Retrieving Understandable Medical Information** **(R01 LM011333; Advanced Informatics for Health)**
Dates	June 1, 2012 – May 31, 2017
Source/Institution	NIH/NLM, National Library of Medicine
Principal Investigator	Alex Bui, PhD
Direct Costs	$1,000,000
Role(s)	Investigator

The objective of this proposal is the development of a framework, named RUMI (Retrieving Understandable Medical Information), which challenges how cancer patients receive information today by making the process of care explicit to the patient, providing access to his/her medical record data in the direct context of a clinical guideline so they can see how decisions are made.

Title	**Is MyPlate.gov approach to helping overweight patients lose weight more patient-centered? (1306-01150)**
Dates	March 1, 2014 – February 28, 2017
Source/Institution	Patient Centered Outcomes Research Initiative (PCORI)
Principal Investigator	William McCarthy, PhD/Lillian Gelberg, MD
Direct Costs	$1,500,000
Role(s)	Investigator

This study proposes a randomized controlled trial comparing the patient-centeredness and efficacy of two government-recommended behavioral strategies for losing excess weight (MyPlate and Calorie Counting). The study utilizes tablet-based software to self-administer questionnaires in community clinics. Results are transmitted to a remote server over a WI-FI or cellular data connection, where they are aggregated and analyzed.

Title	**Using readily accessible social-media data to develop and test cost-effective, scalable virtual pragmatic trials**
Dates	October 15, 2014 – June 14, 2016
Source/Institution	Robert Wood Johnson Foundation
Principal Investigator	Corey Arnold, PhD/Brennan Spiegel, MD
Direct Costs	$210,775
Role(s)	Co-PI

This project will develop and validate a social-media-based patient-reported outcome (PRO) to estimate health-related quality of life (HRQOL). The development of a reliable and validated social-media-based PRO could ultimately help caregivers understand the comparative effectiveness of the therapies prescribed to their patients in a significantly more cost-effective and timely manner.

Title	**UCLA Clinical and Translational Science Institute**
Dates	June 1, 2011 – February 29, 2016
Source/Institution	NIH/NCATS, National Center for Advancing Translational Sciences
Principal Investigator	Steven Dubinett, MD
Role(s)	Investigator, Biomedical Informatics Program

The mission of the UCLA Clinical and Translational Science is to bring UCLA innovations to bear on the greatest health needs of Los Angeles and the nation. The Biomedical Informatics Program (BIP) is a critical dimension of the CTSI enterprise focused on the informatics of Researchers, Subjects, and Data. The overarching goal is to organize each of these domains so that finding, accessing, and (re)using valuable human and information resources is not only possible but efficient.

Title	**Social Media and Direct Patient Reporting in Healthcare: A Tool to Detect, Monitor, and Improve the Illness Experience**
Dates	February 15, 2015 – February 14, 2016
Source/Institution	Shire Pharmaceuticals
Principal Investigator	Corey Arnold, PhD/Brennan Spiegel, MD
Direct Costs	$67,758
Role(s)	Co-PI

In this study, we propose to employ novel techniques to learn new information from patients with IBD using social media and electronic portals (e-portals). In Part I of this study, we will use techniques developed at UCLA that allow us to methodically scan the Internet and Twitter feeds to identify and listen into open, publically accessible patient conversations about IBD. In Part II, we will pilot test an innovative approach to communicating with IBD patients via an e-portal, using a mobile application feature called My QOL that is built into an existing mobile application called My GI Health.

Title	**Harnessing Social Media to Understand the Opioid Induced Constipation Experience**
Dates	March 1, 2014 – August 31, 2014
Source/Institution	Takeda Pharmaceuticals
Principal Investigator	Corey Arnold, PhD/Brennan Spiegel, MD
Direct Costs	$72,313
Role(s)	Co-PI

This study proposes to learn new information from patients with opioid induced constipation (OIC) using social media and online patient e-forums. Using natural language processing (NLP) techniques developed at UCLA, Internet message boards and Twitter feeds will be monitored to identify and listen into patient conversations about OIC. This will provide unprecedented access into the lives of patients suffering with OIC, enabling new

insights into patient perspectives, and creating a conceptual framework governing the OIC biopsychosocial illness experience.

Title	**Imaging-based Medical Informatics Training Grant (T15 LM07536)**
Dates	July 1, 2007 – June 30, 2013
Source/Institution	NIH/NLM, National Library of Medicine
Principal Investigator	Alex Bui, PhD
Direct Costs	$2,987,662
Role(s)	Instructor, student mentor, program developer

The objective of this grant is to support training of the upcoming generation of scientists in medical imaging informatics. The next significant challenge in biomedical informatics will be to support new knowledge discovery: thus, the application domain of this training program will be on informatics in support of clinical and translational research.

Title	**An Imaging-based Disease Model for Understanding Bone Health (R01 EB009306)**
Dates	September 1, 2008 – August 31, 2013
Source/Institution	NIH/NIBIB, National Institute of Biomedical Imaging and Bioengineering
Principal Investigator	Hooshang Kangarloo, MD
Direct Costs	$1,861,990
Role(s)	Research Scientist

This project addresses the development of a disease model for bone development to better comprehend the genesis of osteoporosis.

Title	**Data Structuring and Visualization System for Neuro-Oncology (R01 LM009961)**
Dates	July 1, 2009 – June 30, 2013
Source/Institution	NIH/NLM, National Library of Medicine
Principal Investigator	Ricky Taira, PhD
Direct Costs	$1,906,907
Role(s)	Research Scientist

This proposal addresses the development of a system for facilitating the review of clinical patient data intended to promote an orderly process of medical problem understanding and care. Phenomenological models of disease will be used with natural language processing (NLP) to abstract information from medical reports.

Title	**Toward Individually-tailored Medicine: Probabilistic Models of Cerebral Aneurysms (R01 EB00362)**
Dates	October 1, 2009 – September 30, 2013
Source/Institution	NIH/NIBIB, National Institute of Biomedical Imaging and Bioengineering
Principal Investigator	Alex Bui, PhD/Fernando Vinuela, MD
Direct Costs	$1,579,600
Role(s)	Research Scientist

The objective of this work is the creation of an informatics infrastructure to help elucidate the genesis, progression, and treatment of intracranial aneurysms.

Title	**Statistical Models for Translating Medical Narrative to Patient Information Resources**
Dates	June 1, 2011 – February 2, 2012

Source/Institution   UCLA Radiology Exploratory Research Program
Principal Investigator   Corey Arnold, PhD
Direct Costs $7,322
Role(s)   PI

The objective of this exploratory proposal is the development of a statistical latent topic model for structuring a patient's medical record into semantically meaningful components that may be mapped to patient-oriented information resources, enabling new use cases for patient portals.

LECTURES AND SCIENTIFIC PRESENTATIONS

1. **Arnold CW**, Corso J, Bui AAT. An Unsupervised Approach to Automatic Image Annotation. NSF Biomedical Informatics Workshop: Expanding Secondary Use of Health Data, Portland, OR; December 2007.

2. **Arnold CW**. Exploring medical reports using topic models. Annual National Library of Medicine Trainee Meeting, Washington DC; June 2008.

3. **Arnold CW** and Davis M. Medical report driven literature retrieval to support evidence-based medicine. IBM Almaden Research Center, San Jose, CA; Aug 2008.

4. **Arnold CW** and Hsu W. Biomedical informatics research: implications in healthcare. UCLA Seminar for visiting MBA students of Hochschule Neu-Ulm (HNU), Los Angeles, CA; June 2010.

5. **Arnold CW**. Practical Tools in Biomedical Informatics: Introduction to Natural Language Processing and Machine Learning. UCLA Clinical Translational Science Institute (CTSI) Workshop on Biomedical Informatics, Los Angeles, CA; May 23, 2013.

6. **Arnold CW**. Probabilistic Topic Modeling with Biomedical Data. Charles R. Drew University of Medicine and Science Cross-Disciplinary Lecture Series, Los Angeles, CA; Sept 18, 2013.

7. **Arnold CW** and Oh A. RadPath: Integrating Imaging and Pathology Diagnoses in Lung Cancer. Faculty Research Seminar. UCLA Radiological Sciences, Los Angeles, CA; Nov 6, 2013.

8. **Arnold CW**. Probabilistic Topic Modeling with Biomedical Data. BE 299: Seminar Series. UCLA Department of Bioengineering, Los Angeles, CA; January 30, 2014.

9. **Arnold CW**. Probabilistic Topic Modeling with Clinical Data. UCLA Workshop on Big Data to Knowledge (BD2K), Los Angeles, CA; March 27, 2014.

10. **Arnold CW**. Practical Tools in Biomedical Informatics: Introduction to Natural Language Processing and Machine Learning. UCLA Clinical Translational Science Institute (CTSI) Workshop on Biomedical Informatics, Los Angeles, CA; May 27, 2014.

11. **Arnold CW.** Probabilistic Topic Modeling with Clinical Data. UCLA Clinical Translational Science Institute (CTSI) and Institute for Digital Research and Education (IDRE) Program: Unlocking Patient Data for Novel Research Collaboration, Los Angeles, CA; June 2, 2014.

12. **Arnold CW**. Topic Modeling and its Applications in Biomedical Data. Research Seminar Series, UCLA Institute for Quantitative and Computational Biosciences, Los Angeles, CA; July 24, 2015.

Invited Talks

1. Invited speaker. *Graduate Research in Biomedical Informatics*. UCLA Academic Advancement Program (AAP). Los Angeles, CA; May 2009.

2. Invited speaker. *How UCLA's Pioneering Integration of Radiology and Pathology Services Delivers More Diagnostic Value to Physicians and Patients*. Executive War College Conference on Laboratory & Pathology Management, New Orleans, LA; May 5, 2015.

3. Invited speaker. *Discordance and Integrated Reporting in Lung Cancer Diagnosis*. Department of Radiology Research Seminar, Massachusetts General Hospital, Boston, MA; June 2, 2015.

4. Invited panelist. *Radiologic-Pathologic Correlation: Challenges and Opportunities*. Linking Biomedical and Clinical Data. American Medical Informatics Association Annual Pre-Symposium, San Francisco, CA; Nov 14, 2015.

5. Invited speaker. *Discovering Hidden Themes in Unstructured Biomedical Data*. Health Services Research

Seminar Series. Cedars-Sinai Hospital, Los Angeles, CA; April 28, 2015.

6. Invited speaker. *Exploring Unstructured Biomedical Data with Topic Models*. Health Informatics Professional Interest Community (HIPIC) Seminar. T.J. Watson Research Center, IBM, Yorktown Heights, NY; May 19, 2016.

7. Invited speaker. *UCLA Integrated Diagnostic Report*. Sectra Medical Systems. Linköping, Sweden; October 4, 2016.

8. Invited speaker. *Estimating Perfusion Parameters in Stroke using Deep Learning*. 14th Annual World Congress of the Society for Brain Mapping and Therapeutics, Los Angeles, CA; April 18, 2017.

9. Invited speaker. *Discovering Themes and Quantifying Clinical Narrative using Topic Models*. HeartBD2K Technical Conference. International WebEx; June 2, 2017.

10. Invited speaker. *Predictive Computational Phenotyping of Clinical Images and Text using Machine Learning*. General Medical Sciences Faculty Seminar. Washington University in St. Louis. St. Louis, MO; June 12, 2017.

11. Invited speaker. *UCLA IDxP: Integrated Diagnostic Platform*. Siemens Healthineers Research Seminar. Siemens Healthineers, Erlangen Germany; September 11, 2017.

12. Invited speaker. *Applications of Deep Learning in Radiology and Pathology with Integrated Reporting*. HeartBD2K Technical Conference. International WebEx; February 2, 2018.

13. Invited speaker. *Artificial Intelligence and Prostate MRI: The Future*. MRI, Targeted Biopsy, Intervention and Biomarkers in Prostate Cancer Management. Office of Continuing Medical Education, UCLA. Los Angeles, CA; February 17, 2018.

14. Invited speaker. *Stroke Tissue Fate Prediction and Onset Time Classification using Machine Learning*. Siemens Healthineers Research Seminar. Siemens Healthineers, Erlangen Germany; September 4, 2018.

15. Invited speaker. *Classifying Prostate Cancer from Multiparametric Magnetic Resonance Imaging and Whole Slide Histology Imaging using Machine Learning*. NIH National Cancer Institute Informatics Technology for Cancer Research Annual Meeting, Park City, Utah; May 30, 2019.

16. Invited speaker. *Diagnosing Prostate Cancer in Radiology and Digital Histology Imaging using Machine Learning*. Siemens Healthineers Research Seminar. Siemens Healthineers, Erlangen Germany; September 10, 2019.

17. Invited speaker. *Learning Predictive Computational Phenotypes from Medical Images*. Southern California Biomedical Imaging and Machine Learning Symposium. University of California, Irvine; October 4, 2019.

18. Invited speaker. *Integrating Pathology with Radiology: Discovering Unexpected Opportunities*. Clinical Informatics Grand Rounds. Texas Children's Hospital. September 16, 2020.

19. Invited speaker. *Computational Disease Phenotyping using Machine Learning*. Radiology Grand Rounds. Department of Radiology, University of Wisconsin, Madison. April 1, 2021.

20. Invited speaker. *Computational Image Phenotyping for Stroke and Prostate Cancer*. Berkeley Institute for Data Science ImageXD – Images Across Domains Annual Meeting. May 18, 2021.

21. Invited speaker. *Computational Disease Phenotyping using Machine Learning*. P30 Building and InnovatinG: Digital heAlth Technology and Analytics Center Talk. Division of Clinical Immunology and Rheumatology, University of Alabama, Birmingham. September 10, 2021.

22. Invited speaker. *Deep Learning Applications in Prostate Cancer and Acute Stroke Imaging*. Siemens Healthineers Research Seminar. Siemens Healthineers, Erlangen Germany; September 6, 2022.

23. Invited speaker. *Developing AI for Clinical Applications*. Hood College and Frederick National Laboratory for Cancer Research, AI in Cancer Research and Clinical Care: Turning Promise into Reality Symposium. Frederick, MD; September 20, 2022.

24. Invited speaker. *A UC Radiology Federated Learning Consortium*. UC AI in Radiology Annual Meeting. University of California, San Diego; October 6, 2022.

25. Panel moderator. *The Next Generation of Rad-Path, Facilitated by AI*. American College of Radiology 2022 Imaging Informatics Summit. Washington DC; October 22, 2022.

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45. Gonzalez G, Zektser Y, Khalil C, Vaculik K, **Arnold CW**, Almario C, Spiegel B, Anger J. Womens' Experience with Stress Urinary Incontinence: Insights from a Qualitative Social Media Analysis. Society of Urodynamics, Female Pelvic Medicine & Urogenital Reconstruction (SUFU), Miami FL; April 2019.

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55. Polson J*, Zhang H*, Nael K, Salamon N, Yoo B, El-Saden S, Speier W, **Arnold CW**. Evaluating Automated Approaches for Classifying Stroke Onset Time. Radiological Society of North America Annual Meeting, Virtual; Nov 2020. *Winner, Trainee Research Prize.*

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61. Nobori A, Chayanit J, Chen S, Dry S, Nelson S, **Arnold CW**. The Use of a Novel Digital Tumor Board Platform Reduces Pathologist Tumor Board Preparation Time and Enhances Clinician Satisfaction: the UCLA Experience. United States and Canadian Academy of Pathology Annual Meeting, Virtual; March 2021.

62. Zhang Z, Li J, Li W, Zheng H, Mirak S, Shakeri S, Priester A, Magyar C, Sisk A, Reiter R, Sung K, Raman S, Enzmann D, **Arnold CW**, Wu H. A Framework for Characterizing Prostate Cancer Heterogeneity Using Voxel-Wise Co-Registered Ex Vivo MRI and Whole-Mount Histopathology. International Society for Magnetic Resonance in Medicine (ISMRM) Annual Meeting, Virtual; May 2021.

63. Longitudinal Trajectories of Remotely-Monitored Activity Data in Patients with Stable Ischemic Heart Disease. Gresham G, Benita T, Joung S, **Arnold CW**, Dhawan S, Fuller G, Speier W, Mastali M, Mouapi K, van den Broek I, Wei J, Spiegel B, Van Eyk J, Noel Bairey Merz N, Shufelt C. American College of Cardiology Annual Meeting, Virtual; 2021.

64. Patient Reported Functional Status as a Predictor for N-Terminal Pro Brain Natriuretic Peptide and Cardiovascular Hospitalizations in Patients with Stable Ischemic Heart Disease. Benita T, Gresham G, Joung S, **Arnold CW**, Dhawan S, Fuller G, Speier W, Mastali M, Mouapi K, van den Broek I, Wei J, Spiegel B, Van Eyk J, Noel Bairey Merz N, Shufelt C. American College of Cardiology Annual Meeting, Virtual; 2021.

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69. Redekop E*, Pleasure M*, Sisk A, Flores K, Speier W, **Arnold CW**. Morphology Preserving Alignment of Histology Images for Volumetric Analysis. Association for Pathology Informatics Annual Summit; May 2023.

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71. Wang Z*, Pleasure M*, Redekop E*, Sisk A, Flores K, Speier W, **Arnold CW**. Deep Learning for Tumor-associated Stroma Identification in Prostate Radical Prostatectomy Whole-mount Histopathology Slides. Association for Pathology Informatics Annual Summit; May 2023.

*   *Indicates a student or postdoctoral fellow under Dr. Arnold's supervision.*

PATENTS PENDING

1. A Method of Computational Image Analysis for Predicting Tissue Infarction After Acute Ischemic Stroke, U.S. Provisional Application Serial No. 62/267,328 filed on December 15, 2016.
2. Systems and Methods for Analyzing Perfusion-Weighted Medical Imaging Using Deep Neural Networks, U.S. Provisional Application Serial No. 62/330,773 filed on May 2, 2016.
3. Automated Quality Control of Diagnostic Radiology, U.S. Provisional Application Serial No. 15/254,798 filed on September 1, 2016.
4. Apparatus and Method for Generating a Probability Map of a Biopsy Site, U.S. Provisional Application Serial No. 62/402,075, filed on September 30, 2016.
5. Path R-CNN for Prostate Cancer Diagnosis and Gleason Grading of Histological Images, U.S. Provisional

Application Serial No. 62/913,256 filed on October 10, 2019.
6. Systems and Methods for Automated Image Analysis, U.S. Provisional Application Serial No. 62/402,075, filed on May 26, 2020.
7. An Attention-based Multi-resolution Model for Prostate Whole Slide Image Classification and Localization, U.S. Provisional Application Serial No. 62/852,625, filed on May 24, 2019.