Resources for Field – Organizations, Information, Education

What is Biomedical & Health Informatics?
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Oregon Health & Science University

Resources for field

- Organizations
- Information
- Education
Professional organizations

• AMIA (formerly American Medical Informatics Association)
  – www.amia.org

  Mission
  – AMIA advances the informatics professions relating to health and disease. To this end it advances the use of health information and communications technology in clinical care and clinical research, personal health management, public health/population, and translational science with the ultimate objective of improving health.

Other professional organizations

• Healthcare Information and Management Systems Society (HIMSS) – www.himss.org
• American Health Information Management Association (AHIMA) – www.ahima.org
• Association of Medical Directors of Information Systems (AMDIS) – www.amdis.org
• Alliance for Nursing Informatics (ANI) – www.allianceni.org
• Public Health Informatics Institute (PHII) – www.phii.org
• International Society for Computational Biology (ISCB) – www.iscb.org
• Society for Imaging Informatics in Medicine (SIIM) – www.siim.org
• Association for Computing Machinery (ACM) – www.acm.org
• Medical Library Association (MLA) – www.mlanet.org
Medical and nursing specialty societies (non-exhaustive)

- American Nurses Association (ANA) – [www.nursingworld.org](http://www.nursingworld.org)
- Association of American Medical Colleges (AAMC) – [www.aamc.org](http://www.aamc.org)
- American College of Physicians (ACP) – [www.acponline.org](http://www.acponline.org)
- American Academy of Family Physicians (AAFP) – [www.aafp.org](http://www.aafp.org)

Where does one find more information? Textbooks

Where does one find more information (cont.)? Textbooks

- Hersh, Information Retrieval: A Health and Biomedical Perspective (3rd Edition), Springer, 2009
- Bui and Taira (eds.), Medical Imaging Informatics, Springer, 2010
- Reddy and Agarwal (eds.), Healthcare Data Analytics, Chapman & Hall, 2015
- Skochelak et al. (eds.). Health Systems Science. Elsevier, 2017

More information (cont.), Journals

- Journals of AMIA
  - JAMIA – [https://academic.oup.com/jamia](https://academic.oup.com/jamia)
  - JAMIA Open – [https://academic.oup.com/jamiaopen](https://academic.oup.com/jamiaopen)
- Methods of Information in Medicine (MIM)
- International Journal of Medical Informatics (IJMI)
- Journal of Medical Internet Research (JMIR)
  - JMIR Medical Informatics
- Journal of Biomedical Informatics (JBI)
- Applied Clinical Informatics (ACI)
- Bioinformatics
- Journal of Digital Imaging (JDI)
- Biomed Central (BMC, [www.biomedcentral.com](http://www.biomedcentral.com))
  - BMC Medical Informatics and Decision Making
  - BMC Bioinformatics
More information (cont.), Meetings

- AMIA meetings
  - Annual Symposium
  - Informatics Summit
  - Clinical Informatics Conference
  - Informatics Educators Forum
- Medinfo (biennial)
- Other clinical informatics meetings
  - HIMSS, national meeting and local chapters
  - AMDIS Physician-Computer Connection
- Bioinformatics meetings
  - Pacific Symposium on Biocomputing (PSB)
  - International Society for Computational Biology (ISCB)

More information (cont.), Web sites

- US government
  - HHS ONC – www.healthit.gov
  - Health IT Playbook – https://www.healthit.gov/playbook/
  - ONC HIT curriculum – https://www.healthit.gov/providers-professionals/health-it-curriculum-resources-educators
- Other
  - HealthIT Answers – https://www.healthitanswers.net/
  - Clinfowiki – http://clinfowiki.org
More information (cont.), email lists and blogs

- Email lists
  - HISTalk – [http://histalk2.com](http://histalk2.com)
  - From organizations such as AMIA, HIMSS, AMDIS, etc.
- Blogs – (many!)
  - Geek Doctor (John Halamka, MD) – [http://geekdoctor.blogspot.com](http://geekdoctor.blogspot.com)
  - Healthcare Standards (Keith Boone) – [http://motorcycleguy.blogspot.com](http://motorcycleguy.blogspot.com)
  - Informatics Professor (Hersh) – [http://informaticsprofessor.blogspot.com](http://informaticsprofessor.blogspot.com)

More information (cont.), acronyms

- Always asked, so here is a list
  - Health IT Answers – [https://www.healthitanswers.net/health-it-key-acronyms/](https://www.healthitanswers.net/health-it-key-acronyms/)
  - AMIA – [https://www.amia.org/glossary](https://www.amia.org/glossary)
More information: US government reports

- JASON Report (MITRE, 2014): A Robust Health Data Infrastructure
- Federal Health IT Strategic Plan 2015-2020
- National Library of Medicine Strategic Plan 2017-2027

NLM Strategic Plan (2017)

Goal 1
Accelerate discovery and advance health through data-driven research
1.1 Connect the resources of a digital research enterprise
1.2 Advance research and development in biomedical informatics and data science
1.3 Foster open science policies and practices
1.4 Create a sustainable institutional, physical, and computational infrastructure

Goal 2
Reach more people in more ways through enhanced dissemination and engagement
2.1 Know NLM users and engage with persistence
2.2 Foster distinctiveness of NLM as a reliable, trustworthy source of health information and biomedical data
2.3 Support research in biomedical and health information access methods and information dissemination strategies
2.4 Enhance information delivery

Goal 3
Build a workforce for data-driven research and health
3.1 Expand and enhance research training for biomedical informatics and data science
3.2 Ensure data science and open science proficiency
3.3 Increase workforce diversity
3.4 Engage the next generation and promote data literacy
Sampling from the popular press


Education and training in informatics

- Since a highly multi-disciplinary field, no standard curriculum or accreditation
  - Many programs with diverse curricula
  - After general overview, description of OHSU program given as an example
  - Consult programs’ Web sites for details
- Education historically focused on academics but expanded to meet needs and opportunities for practitioners and users
- Programs come in many flavors: clinical, biomedical, health, bio-, nursing, etc.
- Major funder of programs is NLM, which funds programs to train future researchers at doctoral (PhD) and postdoctoral levels at 14 universities
  - Also funding from other sources, including institutions funding clinical informatics subspecialty fellowships
Academic programs

• List of US informatics programs on AMIA Web site
  – https://www.amia.org/education/programs-and-courses
• NLM-funded programs

Career pathways have diverse inputs and outputs (Hersh, 2009)

Health care professions, e.g., medicine, nursing, etc.
Natural and life sciences, e.g., biology, genetics, etc.
Computer science (CS), IT, and undergrad informatics
Health information management (HIM)
Others, e.g., business, library and info. science

There is no single career pathway, ladder, etc.
Jobs in:
  • Healthcare systems
  • Clinical leadership
  • IT leadership
  • Biomedical research
  • Industry
  • Academia

There are many career opportunities in many settings for all tracks
Cardinal rule (formula) of informatics education

\[
\text{What you do when you get out} = f \left( \text{What you did before you started} + \text{What you learned in the program} \right)
\]

Key attributes of OHSU informatics educational program

- **Building-block structure**
  - Work done at one level can be carried forward to next, i.e., 10x10 → Graduate Certificate → MS (thesis or non-thesis) → PhD

- **Majors**
  - Health & Clinical Informatics (HCIN) – original program; focused on health and healthcare areas
  - Bioinformatics & Computational Biomedicine (BCB) – initial focus on genomics but has expanded to biomedicine
OHSU biomedical informatics core curriculum domains

<table>
<thead>
<tr>
<th>High-Level Competency</th>
<th>Domain Names for Health &amp; Clinical Informatics (HCIN)</th>
<th>Domain Names for Bioinformatics &amp; Computational Medicine (BCB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply core concepts of using data, information, and knowledge to advance health and</td>
<td>Health &amp; Clinical Informatics</td>
<td>Bioinformatics &amp; Computational Biomedicine</td>
</tr>
<tr>
<td>biomedical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply knowledge of appropriate area(s) of health and biomedicine to informatics practice and research</td>
<td>Health Care</td>
<td>Biomedical Science</td>
</tr>
<tr>
<td>Apply computing skills to biomedical informatics</td>
<td>Computer Science</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Apply quantitative methods to biomedical informatics</td>
<td>Evaluative Sciences</td>
<td>Biostatistics</td>
</tr>
<tr>
<td>Apply people and organizational knowledge to informatics</td>
<td>Organizational Behavior and Management</td>
<td>N/A</td>
</tr>
<tr>
<td>Apply advanced scholarship to biomedical and health informatics</td>
<td>Thesis/Capstone/Dissertation Requirements</td>
<td>Thesis/Capstone/Dissertation Requirements</td>
</tr>
</tbody>
</table>

Application of curriculum to specific programs

- 10x10 program is version of introductory course in clinical informatics track
- Graduate Certificate program focuses mainly on first two domains of HCIN major
  - Biomedical informatics
  - Organizational and management sciences
- Master of Science adds other domains plus either
  - Thesis
  - Capstone or Internship – Non-thesis (formerly MBI)
- PhD program adds specialized research training, cognate area of interest, doctoral seminar, and dissertation
Another view of “building block” approach

<table>
<thead>
<tr>
<th>Master of Science</th>
<th>PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Knowledge Base:</td>
<td>- Knowledge Base</td>
</tr>
<tr>
<td>- Health &amp; Clinical Informatics</td>
<td>- Advanced Research Methods</td>
</tr>
<tr>
<td>- Bioinformatics &amp; Computational</td>
<td>- Biostatistics</td>
</tr>
<tr>
<td>Biomedicine</td>
<td>- Cognate</td>
</tr>
<tr>
<td>- Thesis or Capstone/Internship</td>
<td>- Advanced Topics</td>
</tr>
<tr>
<td>Graduate Certificate</td>
<td>- Doctoral Symposium</td>
</tr>
<tr>
<td>- Biomedical Informatics</td>
<td>- Mentored Teaching</td>
</tr>
<tr>
<td>- Organization and management</td>
<td>- Dissertation</td>
</tr>
</tbody>
</table>

http://www.ohsu.edu/informatics-education

Overview of programs available

<table>
<thead>
<tr>
<th>Degree/Certificate Track</th>
<th>PhD</th>
<th>MS Thesis</th>
<th>MS Non-Thesis</th>
<th>Grad Cert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health &amp; Clinical Informatics (HCIN)</td>
<td>On-campus</td>
<td>On-campus</td>
<td>On-campus</td>
<td>On-campus</td>
</tr>
<tr>
<td></td>
<td>On-line</td>
<td></td>
<td></td>
<td>On-line</td>
</tr>
<tr>
<td>Bioinformatics &amp; Computational Biomedicine (BCB)</td>
<td>On-campus</td>
<td>On-campus</td>
<td>On-campus</td>
<td>N/A</td>
</tr>
</tbody>
</table>
OHSU informatics – by the numbers

International students from: Argentina, Singapore, Egypt, Israel, Saudi Arabia, Zimbabwe, Thailand, China, and other countries

<table>
<thead>
<tr>
<th>Degree</th>
<th>Total</th>
<th>BCB</th>
<th>HCIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate</td>
<td>455</td>
<td>0</td>
<td>455</td>
</tr>
<tr>
<td>Certificate</td>
<td>348</td>
<td>46</td>
<td>302</td>
</tr>
<tr>
<td>Master's (any)</td>
<td>28</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>831</td>
<td>55</td>
<td>776</td>
</tr>
</tbody>
</table>

How have OHSU students and graduates done?

- Over 20 years of experience...
- General observation: What people do when they graduate is partially dependent on what they did when they entered, e.g.,
  - Physicians, nurses, public health, etc. draw on their clinical/professional background
  - Information technology professionals draw on their unique background and experience
- Graduates have obtained jobs in a variety of settings, e.g., clinical, academic, and industry
- Some have obtained jobs before finishing the program