Computing-Related Grant Programs
NIH and NLM

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Overview

- Introduction to NIH and NLM
  - NIH = “National Institutes of Health”
  - NLM = “National Library of Medicine”
- The computational and “informatics” scene at NIH
- A primer on NIH funding
- NLM grant programs

- See also “extra slides” we won’t cover this AM
National Institutes of Health

- The steward of medical and behavioral research for the nation
- One of the world's foremost medical research centers
- Intramural and Extramural research
  - Research Grants and Contracts; Training programs
- $29 billion Congressional appropriation in FY 2005
National Institutes of Health

- 27 Institutes and Centers ("ICs")
  - "Categorical" Institutes - Cancer, Heart, Lung & Blood, Kidney, etc.
  - "Non-Categorical" Institutes - NIGMS, NHGRI, NCRR, NIBIB, NLM
- 77,900 grant applications received in FY 2005
NIH and Computer/Information Science

- Historically, NLM was the “IC for computing”
- Then three epochal events changed things:
- Now computing and informatics at NIH is spreading faster than it can be tracked
So What Is Informatics?

Basic Informational & Computational Sciences

Information Science
Computer Science
Statistics
Cognitive Science
Organizational Science
etc.

“<Domain> Informatics”

An Application Domain

Health Care
Biology
Public Health
Clinical Research
etc.
An “Informatician” is Different…

What an Informatician Knows

Basic Informational & Computational Sciences

An Application Domain: Biology or Medicine

What an Information Scientist Knows

What a Biologist or Physician Knows

Domain: Biology or Medicine
The Question of Training…

The trade-offs between:

- “Domain generic” computer or information science training
- Informatics cross-training with domain immersion
- Some CS/IS graduates may want postdoctoral informatics training
NIH Roadmap

Pan-NIH initiatives
Computing threaded through all of them

- New Pathways to Discovery: Biological pathways, molecular libraries, bioinformatics, nanomedicine, computational biology
- Research Teams of the Future: Interdisciplinary; team science; high risk research
- Reengineering Clinical Research: Research networks, outcomes assessment, translational research
National Centers for Biomedical Computing

- Grew out of BISTI and Roadmap
- Networked national effort to build a computational infrastructure for biomedical research
  - From basic research in computational science to providing computational tools and resources for biomedical/behavioral research
- $4,000,000 per year for 5 years
- 4 funded in 2004; 3 more in 2005
Computing at NIH is no longer localizable…

The Structure of NIH Funding Opportunities

- Program Announcements (PA): Areas of persistent interest; recurring submission dates
- Requests for Applications (RFA): One-shot but may be reissued
- PAs and RFAs may be issued by a single IC or multiple ICs
- There are multiple grant mechanisms; e.g.:
  - $R_{xx}$ = research grants
  - $K_{xx}$ = career development awards
Some Rudiments of NIH (and NLM) Grant Procedures

- After submission, grant applications are assigned to ICs for oversight and payment, should the application be funded

- **Assignment is distinct from merit review!**

- Two modes of merit review assignment:
  - Review by the study sections under the assigned ICs (~ single IC oppys)
  - Review by study sections administered by the Center for Scientific Review (~ multi-IC oppys)
Grant Review Outcomes

- **PRIORITY SCORES** on 100 (best) to 500 (worst) scale
  - 100-150 (most likely to be funded)
  - 150-170 (seldom funded)
  - 170-200 (rarely funded)
  - 250-500 (never funded; sometimes don’t receive scores)

- Priority scores are the primary basis of award decisions

- Most applications can be revised and resubmitted twice
Some Hints and Tips

- Generate a idea
- Find potentially compatible receptor sites (PAs and RFAs)
  - Hard to “create” a receptor site at NIH
  - Program scopes are broad but inflexible at boundaries
- Write a “one pager”
- Contact the program officer (you may be referred to a better receptor!)
- Visit if possible
- Don’t expect funding the first time
Funding Activities at NLM

- **Biomedical Informatics is NLM’s research domain**
  - We don’t fund generic CS/IS
  - Projects must be domain-immersed

- Grants (Mostly Recurring PAs)

- Contracts (Mostly Episodic)

- Training (Recurring)
  - Fellowships for informatics researchers, informationists
  - 18 University-based Training Programs
  - Lister Hill Center intramural training opportunities
  - NCBI short term training
  - Woods Hole Informatics Short Course

- Career Development Awards (Recurring)
**NIH in FY 2005**
- $29 billion from Congress, $19.8 billion in research grants
- 77,904 grant applications received, 5.6% increase over FY 2004
- 27,700 active grants
- Average research grant = $355K, 3.7 years

**LM in FY 2005**
- $317.9 million for NLM, $54.2 million for EP grants
- 500 grants assigned to NLM, 80% reviewed by NLM
- 150 active grants
- Average research grant = $390K, 4.5 yrs
NLM Informatics Research Areas of Interest (PA06-094): Must be Domain-Immersed!

- Information and knowledge processing, including natural language processing, information extraction, integration of data from heterogeneous sources or domains
- Tools for analyzing and/or storing very large datasets
- Knowledge representation, including vocabularies, ontologies, simulations and virtual reality
- Linkage of clinical and genomic information
- Innovative uses of information technology in health care delivery or public health
- Efficient management and utilization of information and data
- Knowledge acquisition and management, process modeling, data mining, acquisition and dissemination
- Human-machine interaction, including interface design, use and understanding of health related-information
- Uses of information technology to enhance learning, retention and understanding of health-related information
Career Development Awards

- NLM is focusing on new “Pathways to Independence” Awards (K99/R00: PA-06-133)
- One award provides up to five years of support in two phases:
  - 1-2 years of mentored support for postdocs
  - Up to 3 years of independent support contingent on acquiring a tenure-track position
  - 2nd phase does not require a separate competing application
- Minimum 75% supported research effort in both phases
NLM’s 18 Training Sites
Research Grant Programs

- R01 – Traditional ‘investigator-initiated’ research projects – hypothesis driven research; average $350,000/yr for 3 yrs
- R21 – Exploratory/Developmental research grants – feasibility & proof of concept; “high risk” $275,000 over 2 years
- R03 – Small research projects – no prelim data needed; $50,000/yr for 1 or 2 yrs
R01 (Vanderbilt): Clinical and Microarray Data Predict Lung Cancer Outcomes. Compare rule-based induction to support vector and artificial neural networks; develop and validate backward chaining rule induction as a means of ‘semi-supervised’ learning
Research Grant example

- R01 (Columbia): Discovering & Applying Knowledge in Clinical Databases. Develop and test methods to mine a clinical data repository, exploiting latent associations and methods of data representation to improve classification of cases characterized by complex, missing or inaccurate data, using nearest neighbor and case-based reasoning.
Research Grant example

- R01 (Michigan): Computational Approaches, Protein Sequence Analysis. Develop automated knowledge extraction techniques to find molecular biology data expressed as assertions in published articles through multi-stage parsing and preposition templates, making inferences on molecular biological context
Exploratory Research Grant

- R21 (Indiana). Syndromic Surveillance Data Exchange & Analysis. Incorporate geospatial clustering with temporal information to develop pattern recognition algorithms for de-identified patient data at hospitals in 2 cities.
Small Research Grant

- R03 (UCLA) Content-based Neuro Image Classification: Perform automated classification of tumor images based on principal componential analysis and provide ability to query by sub-regions of an image
Points of contact at NLM Extramural Programs

- Dr. Milton Corn – NIH Roadmap initiatives
- Dr. Valerie Florance – Research in clinical informatics and information sciences; IAIMS; career development awards
- Dr. Charles Friedman - Research in bioinformatics; Training Programs, Fellowships, National Biomedical Computing Centers
- Dr. Hua-Chuan Sim – KM/AI grants; R03 Small grants; Conference grants; Scholarly Works grants, SBIR/STTR
Basic NLM Contact Information

- friedmanc@mail.nih.gov
- 301-594-4882 for Florance, Friedman
- 301-496-4253 for Sim
- 301-496-4621 for Corn
- http://www.nlm.nih.gov/ep for program announcements, FAQ, links to application forms, list of funded projects
- http://www.nlm.nih.gov/grants.html for intramural fellowships, research contract information
Additional Slides Follow
Grants for Small Businesses

- SBIR/STTR phase 1 and 2 grants for companies that want to bring a product to market
- For NLM, priorities are the same as for research grants in biomedical informatics
- Fast-track possible – combine phase 1 and 2 in a single application
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<thead>
<tr>
<th>Criterion</th>
<th>Questions in Reviewer’s mind</th>
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<tbody>
<tr>
<td>Significance</td>
<td>■ Does it address an important problem?</td>
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<td>Approach</td>
<td>■ Is the conceptual framework sound?</td>
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<td>■ Is related work discussed?</td>
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<td>■ Are potential problems recognized?</td>
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<td>Innovation</td>
<td>■ Are the aims, concepts, methods and/or outcomes novel?</td>
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<td>Investigator</td>
<td>■ Does the PI/team have appropriate training and experience?</td>
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<tr>
<td>Environment</td>
<td>■ How sound is the scientific environment?</td>
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## NLM Grant Deadlines

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<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Cycle 3</th>
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<tr>
<td>Research, Career,</td>
<td>1-February</td>
<td>1-June</td>
<td>1-October</td>
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<td>Resource Grants</td>
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<td>Revised Applications</td>
<td>1-March</td>
<td>1-July</td>
<td>1-November</td>
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<td>SBIR/STTR</td>
<td>1-April</td>
<td>1-August</td>
<td>1-December</td>
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<td>Fellowships</td>
<td>5-April</td>
<td>5-August</td>
<td>5-December</td>
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Review Steps for Grants

- REVIEW STEP
- Received at CSR
- 1st Review by BLIRC
- 2nd Review by BOR
- Final Decision, NLM

- TIMETABLE
- Feb 1 (Jun 1, Oct 1)
- May (Nov, Mar)
  - Priority scores @ 1 week
  - Summary statement @ 6 week
- Sept (Feb, May)
- @ Nov (Apr, Aug)
  - Notice of grant award mailed
Components of Good Proposals

- Responsive to the program announcement
- Clearly-stated goals and methodology
- A detailed work plan that fits the stated goals, with timeline and milestones
- References to the published literature and/or state of the art tools & systems
Components of Good Proposals

- Research grant proposals require a testable hypothesis and/or an accepted, rigorous research methodology.
- Exploratory/developmental grant proposals need milestones and expected benefits.
- Involvement of experts from the application domain (biomedical scientists, clinicians).
Components of Good Proposals

- Interesting pilot data
- Evidence that problems & contingencies have been considered
- Key personnel with relevant expertise and adequate FTE dedicated to the work
- Letters of agreement from named collaborators & consultants