Measuring Grant Productivity

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The National Institutes of Health

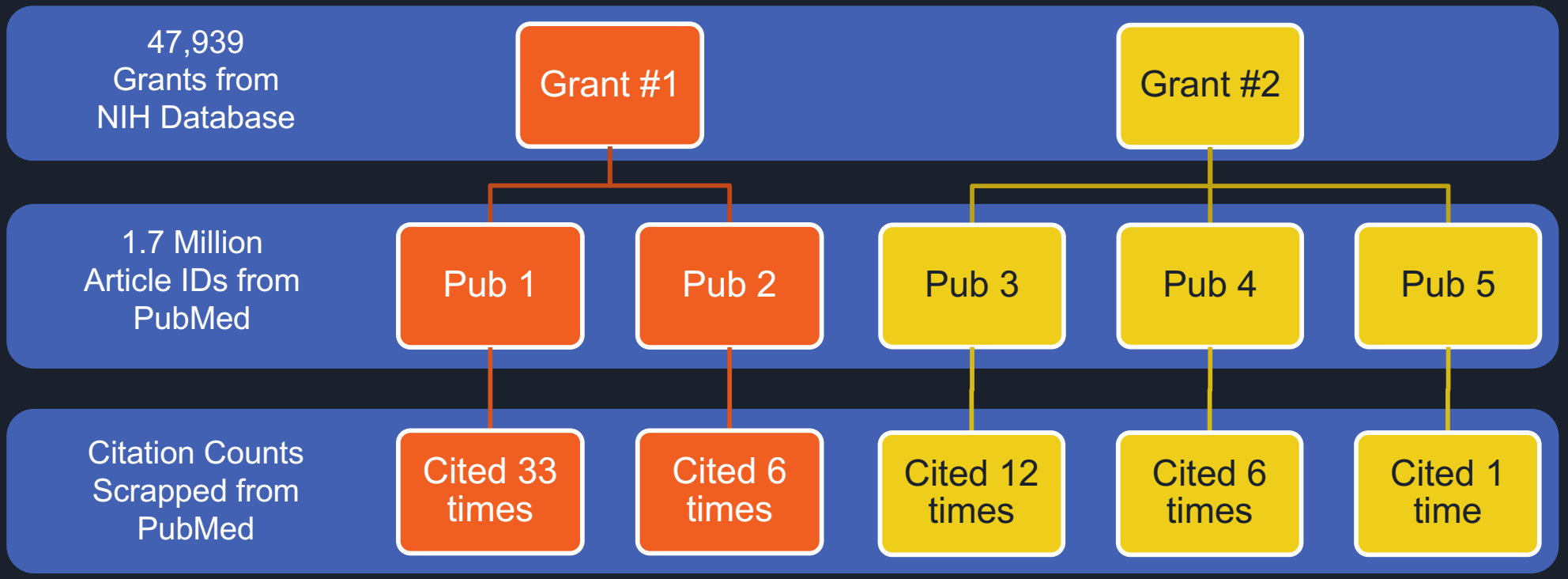
NIH Budget:

- In 2018: $37 Billion
- 90+ Grant Mechanism

2016-2020 Strategic Plan:

- "...enhance scientific stewardship by recruiting and retaining an outstanding biomedical research workforce, enhancing workforce diversity and impact through partnerships, ensuring rigor and reproducibility, optimizing approaches to inform funding decisions, encouraging innovation, and engaging in proactive risk management practices"

Data from:
NIH Reporter & PubMed



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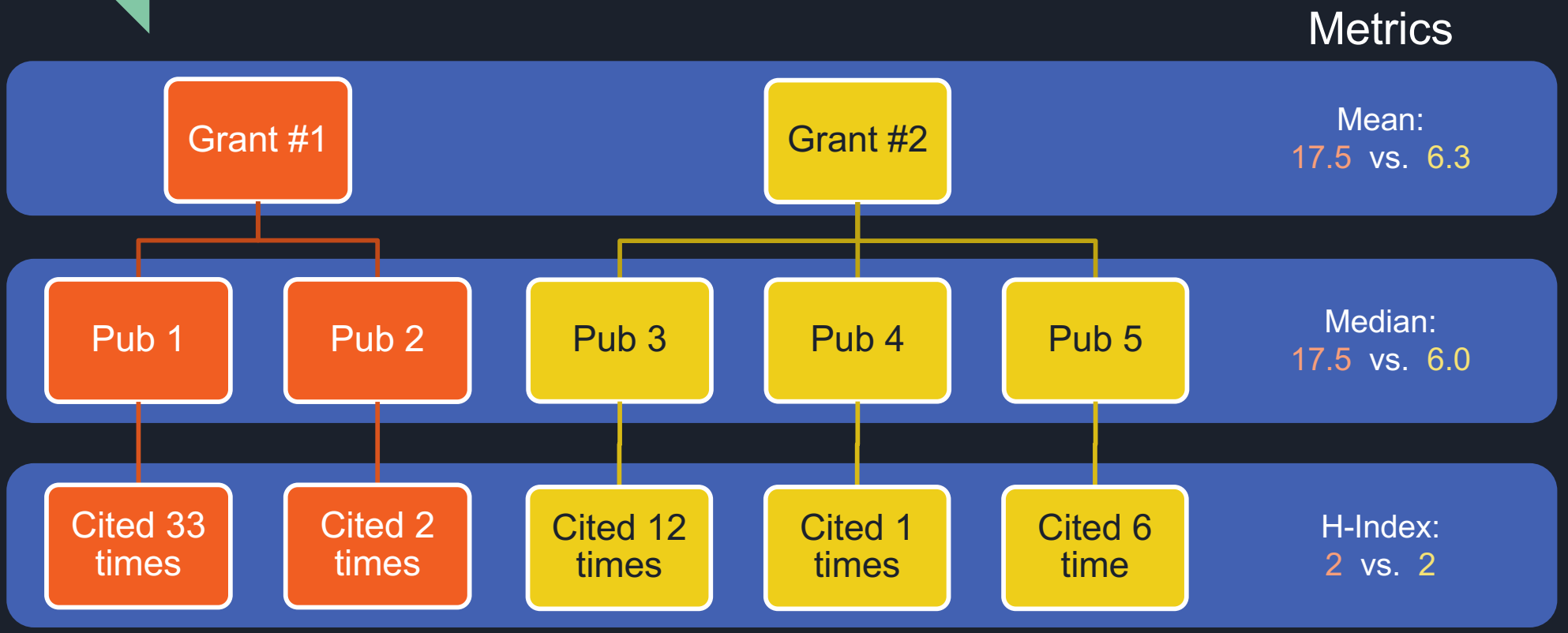
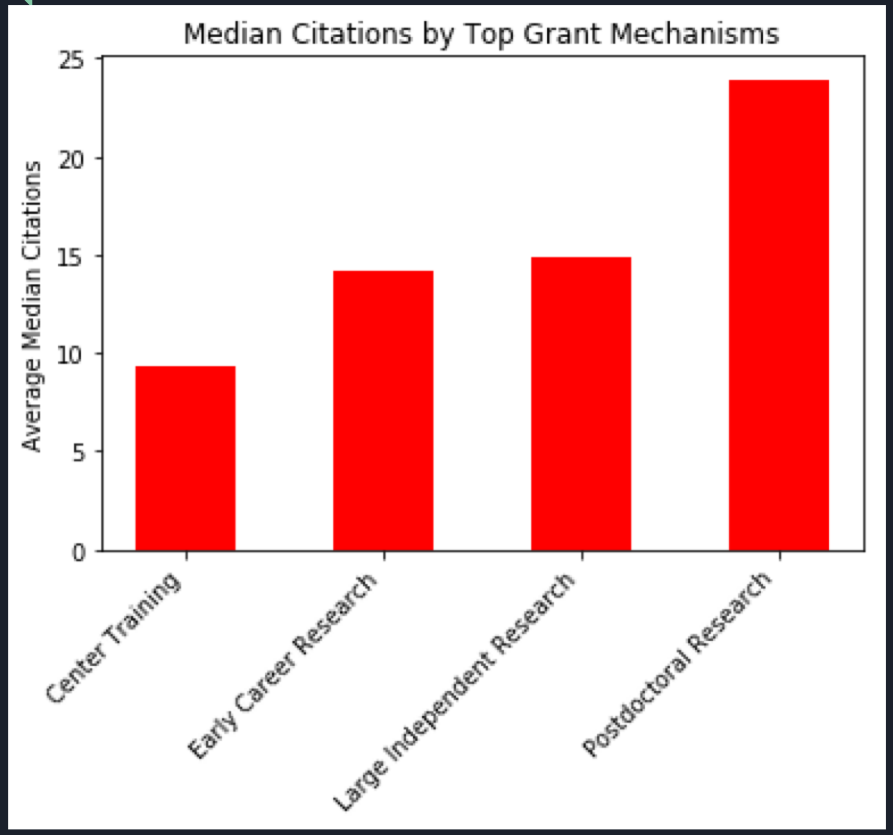
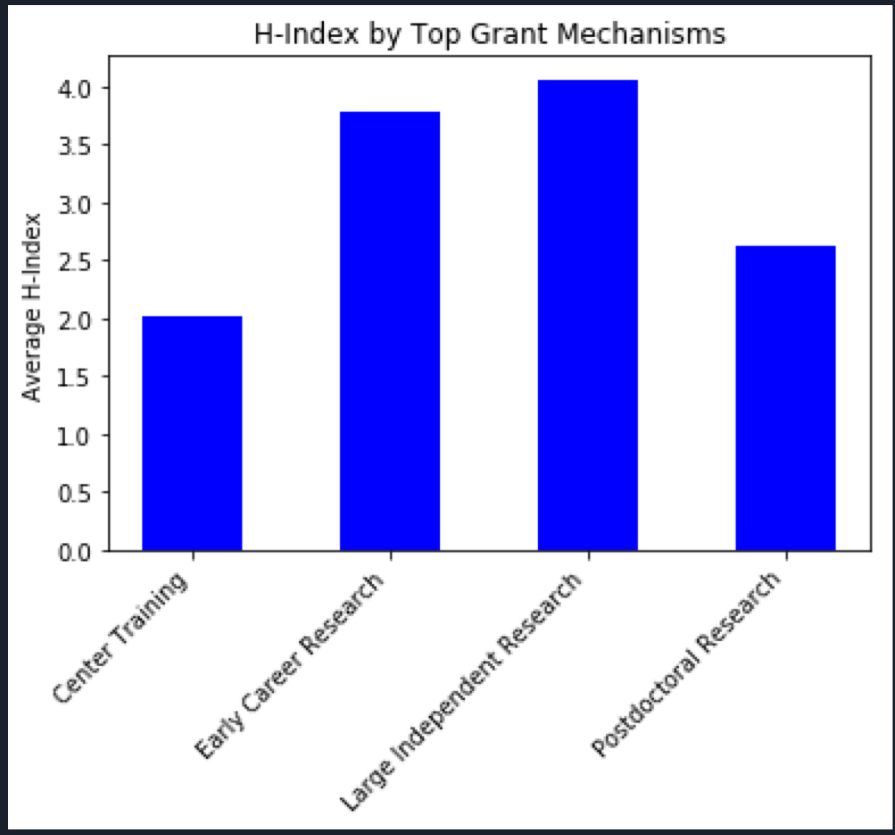
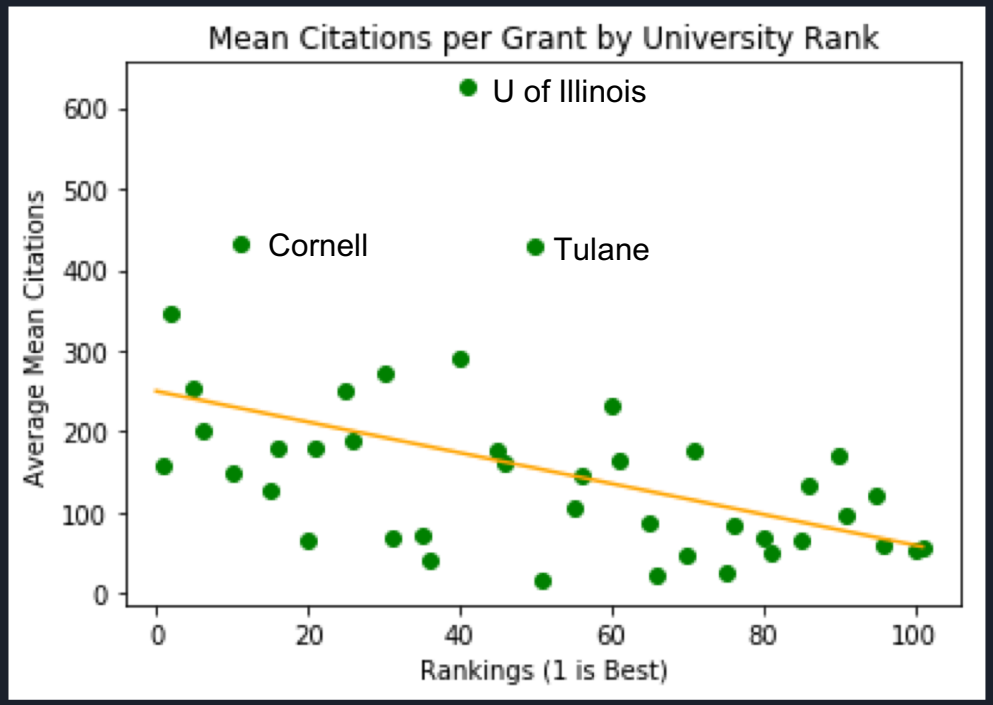


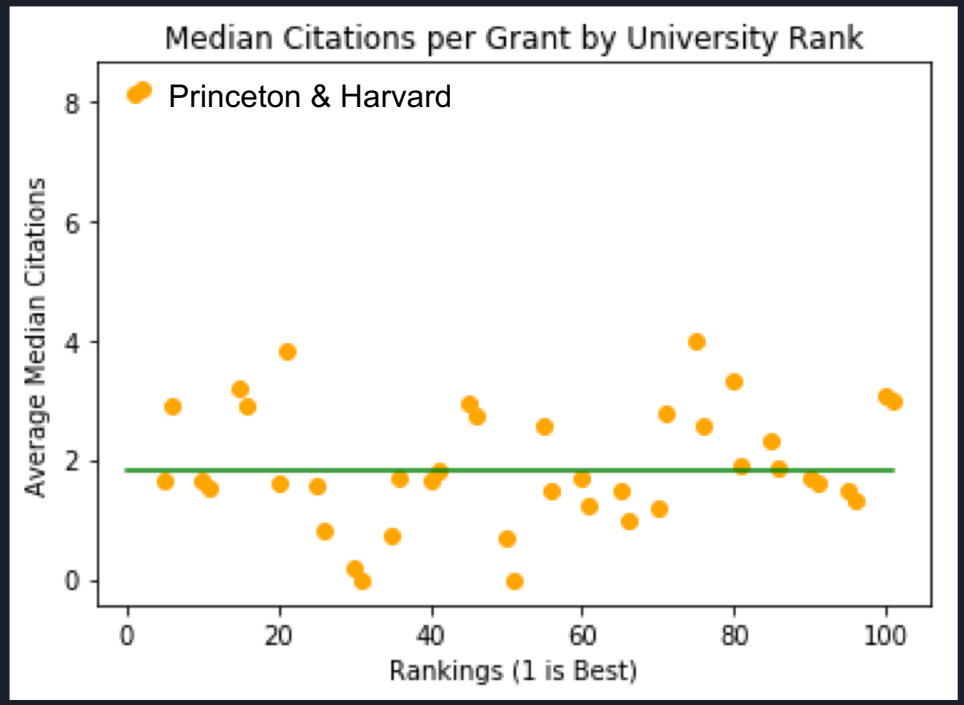
All Active Grants in 2000
Most Prevalent Mechanisms





All Active Grants in 2000 University Rankings





Use of Metrics
Inform Funding Decisions

- Identify Highly Productive:
  - Mechanism
  - Centers
  - Researchers
  - Institutions

- Answer factors that produce Influential Research :
  - Prestigious institutions
  - Collaborations

Analysis:
Predicting Investigator Has a Grant in 2010

Are previous grant productivity predictive of getting grants in the future?

- Logistic Regression using sklearn (R^2 = 0.6576)
- Features:
  - Total citations *(b = -0.000012)*
  - Mean Total citations *(b = -0.000046)*
  - Mean citations *(b = 0.012230)**
  - Min citations *(b = -0.046555)**
  - Max citations *(b = 0.000968)*
  - Median citations *(b = 0.027784)**
  - Mean H-Index *(b = 0.010877)**
  - Citation Count *(b = 0.308636)**

*Most influential features

Are previous grant productivity predictive of getting grants in the future? Adding Average University Rank

- Logistic Regression using sklearn (R^2 = 0.6558)
- Features:
  - Total citations *(b = -0.000005)*
  - Mean Total citations *(b = -0.000085)*
  - Mean citations *(b = 0.004299)*
  - Min citations *(b = -0.055189)**
  - Max citations *(b = 0.000263)*
  - Median citations *(b = 0.035785)**
  - Mean H-Index *(b = -0.027774)**
  - Citation Count *(b = 0.188108)**
  - Mean University Rank *(b = -0.005582)*

*Most influential features

Do metrics of influence predict University Rank?

- Linear Regression using sklearn ($R^2 = 0.0446$)
- Features:
  - Total citations *(b = 0.000091)*
  - Mean Total citations *(b = -0.000731)*
  - Mean citations *(b = -0.156823)*
  - Min citations *(b = 0.050896)*
  - Max citations *(b = -0.002052)*
  - Median citations *(b = -0.060034)*
  - Mean H-Index *(b = -0.049596)*
  - Citation Count *(b = -1.852211)*

Conclusions

- The best predictor of a future grant is the number of previous grants.
- As the graphs suggest, University rank is not strongly associated with the level of influence of the research being produced at that institution.
    - Confirmed by the poor R^2 value in the 3rd analysis.