



Leveraging Data and Analytics to Enhance the Societal Impact of University Research



Nick Fowler, Elsevier and Mark Hurwitz, Cornell University
UIDP meeting - June 7, 2022

Themes



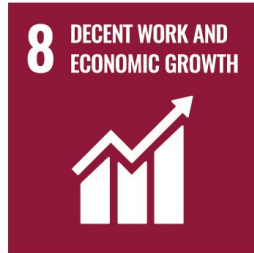
- 1 US communities are facing myriad challenges that are often local variations of global challenges, and universities can anchor partnerships leading to solutions
- 2 Universities are making strategic choices about where and how to focus their resources to optimize the societal impact of their research enterprise
- 3 Cornell University and Elsevier are collaborating to test a hypothesis that data and analytics can inform the campus's efforts and investments around the societal impact of research with patent and alumni data

1

US communities are facing myriad challenges that are often local variations of global challenges, and universities can anchor partnerships leading to solutions

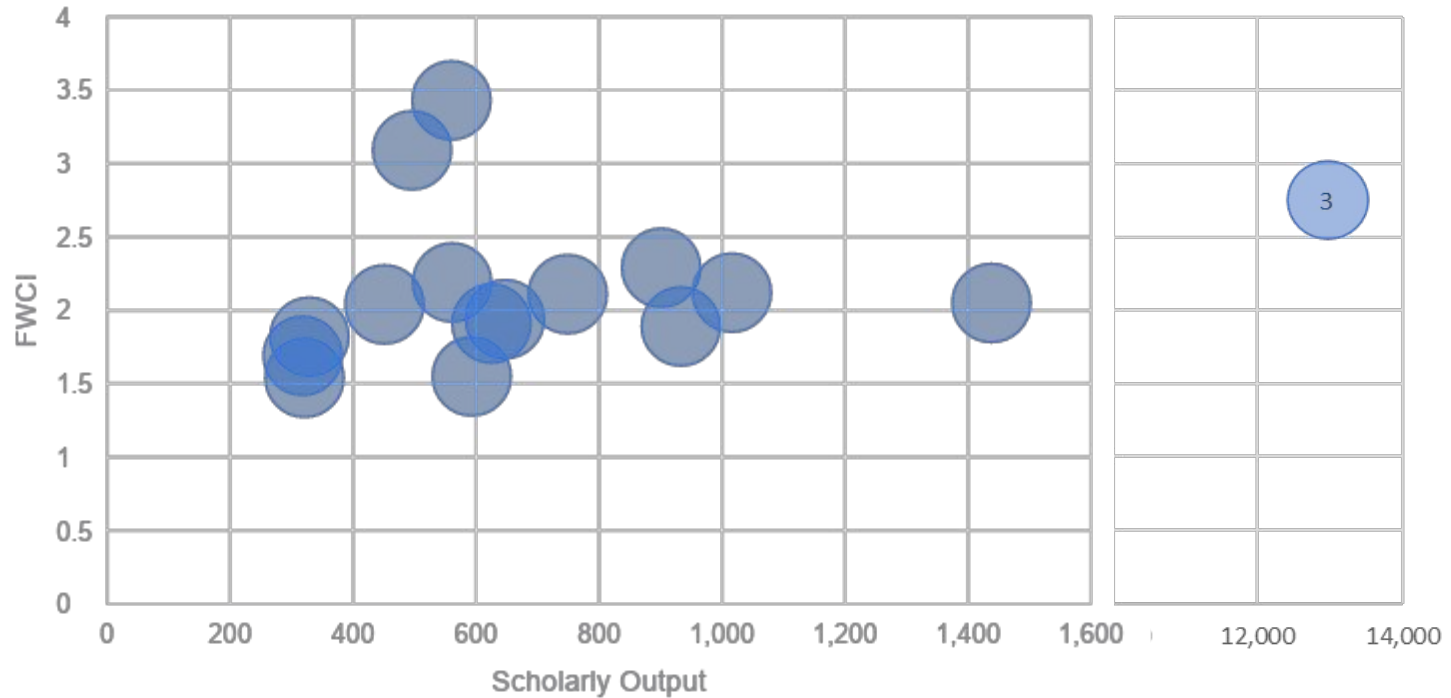


SUSTAINABLE DEVELOPMENT GOALS



Cornell University: SDG Research Volume and Citation Impact, 2016-2020

Scholarly Outputs and Citation Impact





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Building US Innovation Capacity

[Home](#) / [Funding](#) / [NSF Initiatives](#) / [Regional Innovation Engines](#) / [Updates](#)

/ [Funding Opportunity: NSF Regional Innovation Engines Broad Agency Announcement](#)

TIP Directorate:
New NSF focus on
social and
economic impact.

Funding Opportunity: NSF Regional Innovation Engines Broad Agency Announcement

May 3, 2022

Jumpstart your region's innovation ecosystem with up to \$160 million of NSF funding for up to 10+ years.

The National Science Foundation's [Regional Innovation Engines, or NSF Engines](#), is seeking regional teams rooted within industry, academia, government, nonprofits, civil society, and communities of practice to catalyze and foster innovation ecosystems across the U.S. to:

- Advance critical technologies
- Address national and societal challenges
- Promote and stimulate economic growth and job creation
- Spur sustainable, regional innovation and nurture diverse talent



The NSF Engines program and [funding opportunity](#) is a unique way to drive economic growth in regions that have not fully participated in the technology boom of the past few

8 DECENT WORK AND
ECONOMIC GROWTH



9 INDUSTRY, INNOVATION
AND INFRASTRUCTURE



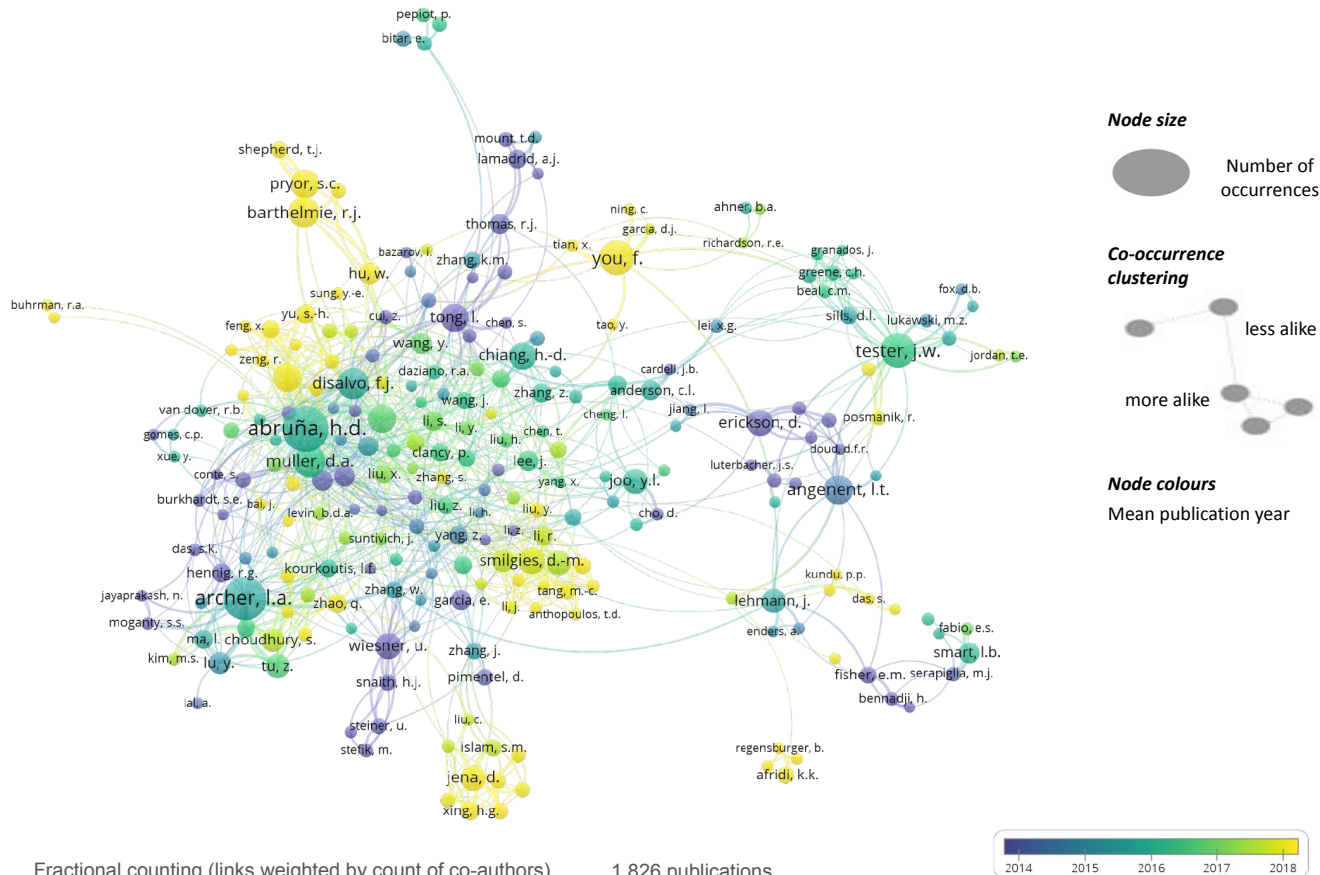
2

Universities struggle with strategic resource allocation to optimize societal impact of their research enterprise

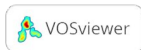
Are real time continuous improvement tools a viable alternative to expensive periodic strategic plans?



Identifying partnerships for SDG #7 at Cornell through co-authorship



File:Sustainable Developmen...

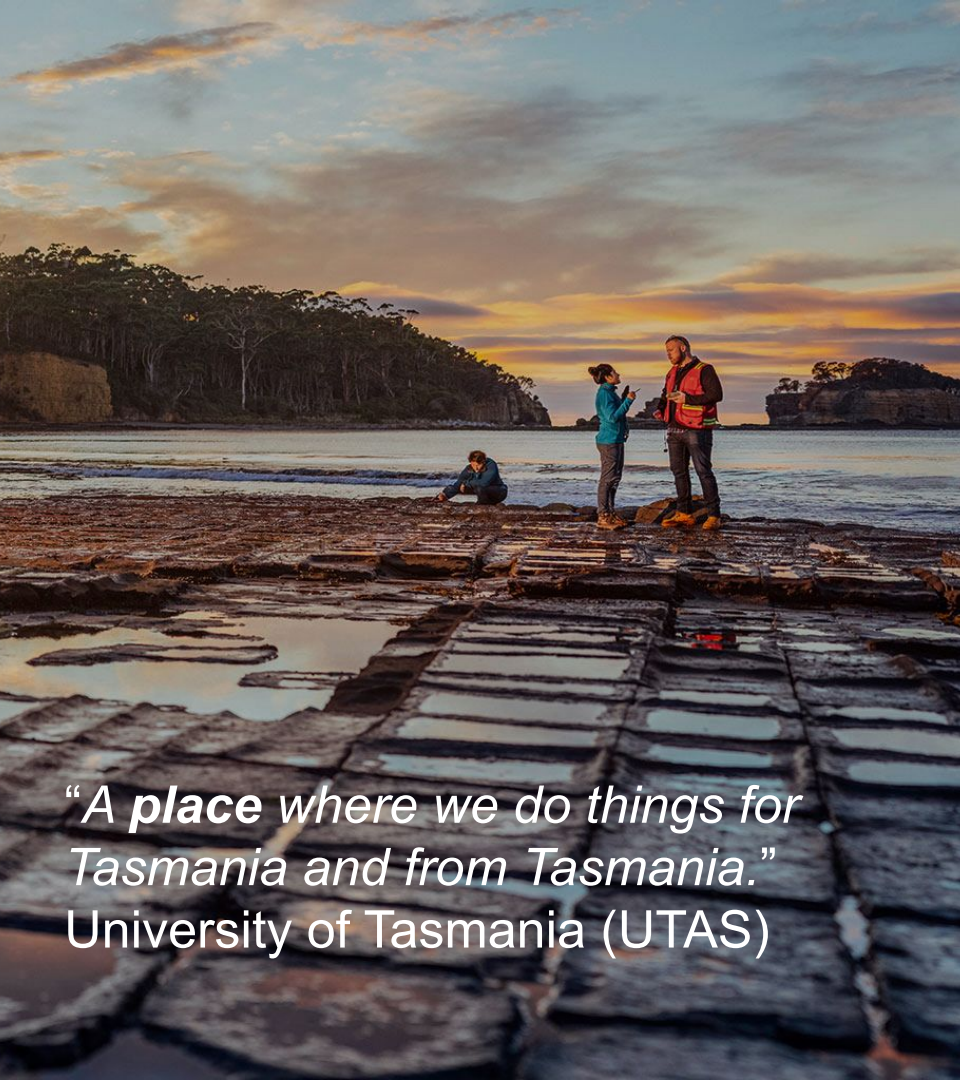


Fractional counting (links weighted by count of co-authors)
All authors on hyper-authored publications (>25) excluded
Authors with at least 6 occurrences

1,826 publications
Total 4,645 authors
Mapped 243 authors

UTAS and Elsevier - the 'Tasmania Model'

1. Frame the problems to solve
derived from the UTAS Strategy
2. Identify the most pressing challenges
to address
e.g. hypertension, climate change mitigation
3. Assess the ability of the university
to make a difference
strong partnerships across sectors
4. Build action plans to amplify impact
investment priorities and attracting funding
5. Implement action plans and measure
progress



*“A **place** where we do things for
Tasmania and from Tasmania.”*
University of Tasmania (UTAS)

University considerations

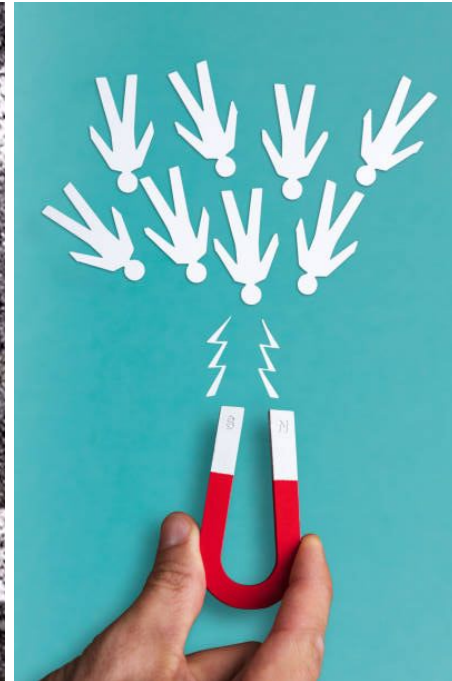
Which challenges
to address?



Which partnerships &
collaborations to
pursue?



How to attract talent
in priority areas?



How to communicate
impact?



Cornell FY 2021 Research Expenditures Data



TOTAL FUNDING BY CORNELL DIVISION	TOTAL EXTERNAL FUNDING	SPONSORED FUNDING BY FEDERAL AGENCIES	FUNDING BY OTHER SOURCES	TOTAL EXTERNAL SPONSORED FUNDING
<ul style="list-style-type: none"> Endowed Colleges \$306.7 M Contract Colleges \$364.7 M Medical Colleges \$551.5 M 	<ul style="list-style-type: none"> Total \$877.9 M Federal \$592.4 M Nonfederal \$285.5 M 	<ul style="list-style-type: none"> DHHS - Department of Health & Human Services \$351.1 M NSF - National Science Foundation \$110.3 M DOD - Department of Defense \$49.2 M USDA - Department of Agriculture \$31.3 M DOE - Department of Energy \$21.9 M NASA - National Aeronautics and Space Administration \$7.5 M USAID - Agency for International Development \$6.0 M All Others \$8.4 M 	<ul style="list-style-type: none"> Foundations \$81.8 M New York State (appropriated) \$66.7 M Corporations \$73.2 M State & Local Governments \$21.1 M Nonprofit Organizations \$35.4 M Federal (appropriated) \$6.6 M All Other Nonfederal \$7.3 M Cornell University \$344.9 M 	<ul style="list-style-type: none"> Total \$804.6 M

Cornell is a:

Research University
Land-Grant University
Ivy League University

Examples of Cornell's Societal Impact



THOUGHT LEADERS IN ECONOMIC IMPACT & ENTREPRENEURSHIP



THE GIG ECONOMY

Louis Hyman has written about the rise of consultants, temps, freelancers and day laborers.

[Learn more](#) >



FEEDING THE WORLD

Plant breeder Mike Gore harnesses cutting-edge technologies to speed the engine of evolution.

[Learn more](#) >



HEALTH TECH

MacArthur fellow Deborah Estrin is trailblazing the use of mobile devices and data to address social challenges.

[Learn more](#) >

US patents issued to Cornell from 2012 to 2021 – 1,035

Active Cornell technology startups – 247

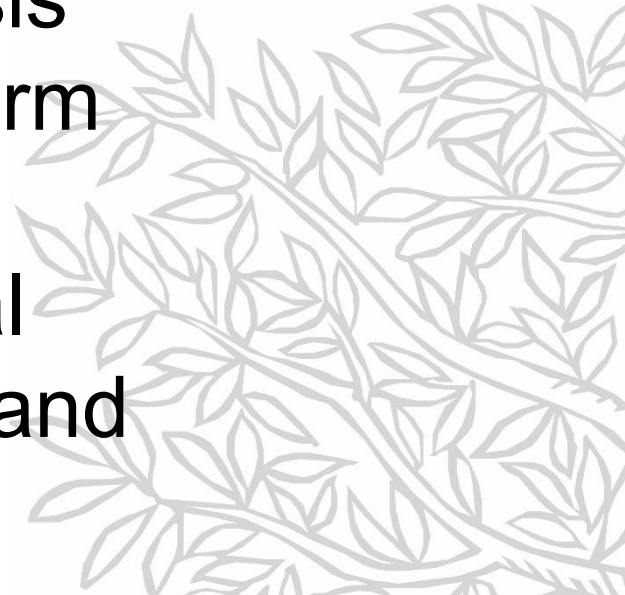
2021 FTE – 1,475

Startup funding raised in 2021 - \$562M

Overall startup funding raised – more than \$3.3B

3

Cornell University and Elsevier are collaborating to test a hypothesis that data and analytics can inform the campus's efforts and investments around the societal impact of research with patent and alumni data



Genesis of a Collaboration



#Views #Opinion

Research Universities and the Innovation Economy

America's dominance is currently at risk, and a new model is needed now more than ever, argue

Michael I. Kotlikoff, Emmanuel P. Giannelis and Glenn C. Altschuler.



By [Michael I. Kotlikoff](#), [Emmanuel P. Giannelis](#) and [Glenn C. Altschuler](#) // April 27, 2021

More than a century after Thomas Newcomen, a miner, and John Calley, his plumber assistant, invented the first useful steam engine, the French scientist Sadi Carnot developed the theory of thermodynamics to explain it. And in 1903, the bicycle makers Orville and Wilbur Wright made the first powered flight, but the underlying mathematics of aerodynamic theory were explained by a university scientist -- Ludwig Prandtl at Hannover University -- almost two decades later.

INSIDE
HIGHER ED



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Employment outcomes of Cornell graduate student alumni

A scoping study

Dr Andrew Plume

President, International Center for the Study of Research

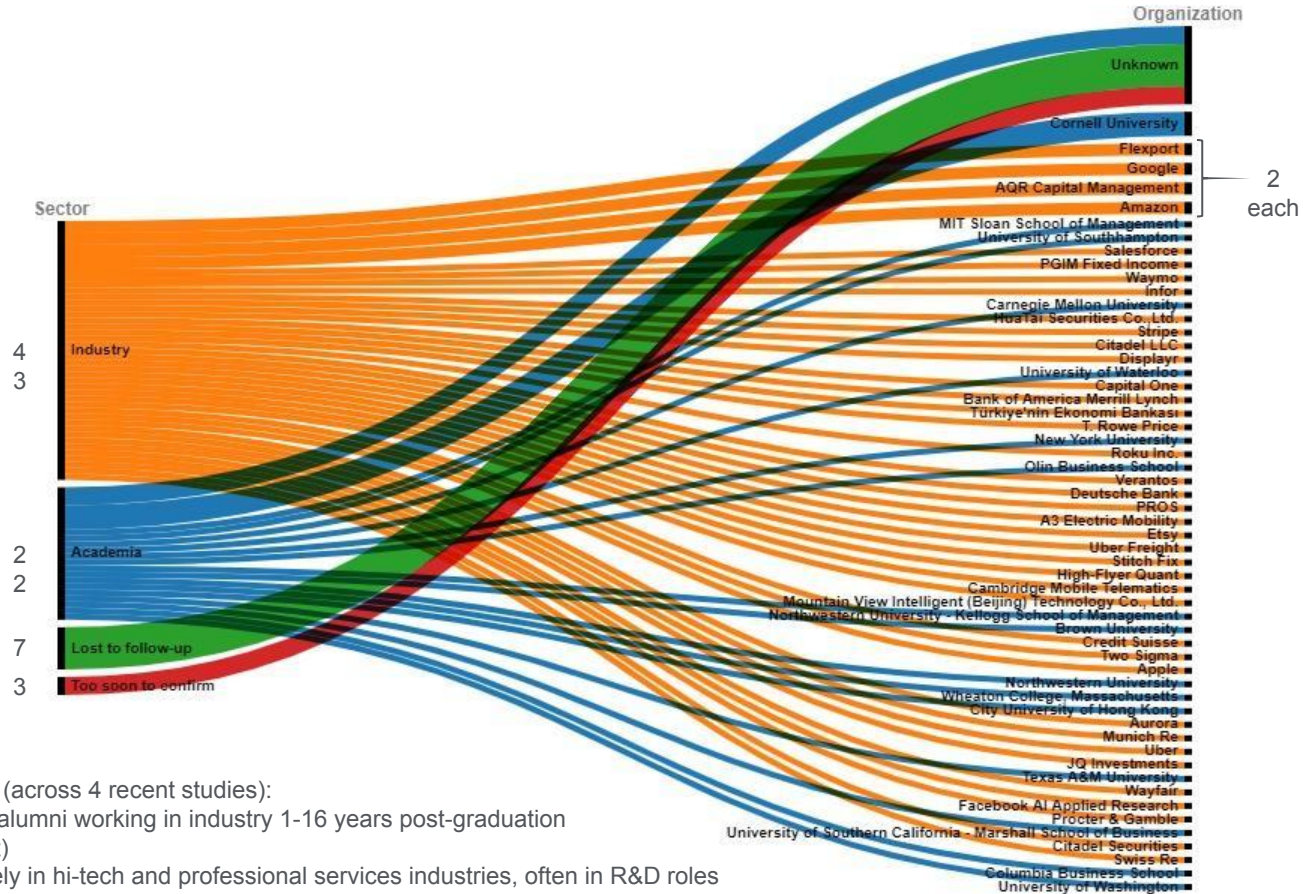
Vice President, Research Evaluation, Elsevier



What is their precise role (inferred by job title), and how does it relate to their graduate school program area?



Where are Cornell's graduate school alumni working today? What companies/organisations are they working at?



From the literature (across 4 recent studies):

- 18-50% of PhD alumni working in industry 1-16 years post-graduation (field-dependent)
- Disproportionately in hi-tech and professional services industries, often in R&D roles

Are trends in alumni outcomes evident over time?



Year	Academia	Industry	Alumni
2005	100%		1
2009	100%		1
2010		100%	1
2011		100%	1
2012	14%	86%	7
2013	44%	56%	9
2014	20%	80%	5
2015	14%	86%	7
2016		100%	5
2017	75%	25%	4
2018		100%	2
2019	33%	67%	12
2020	33%	67%	6
2021	100%		4
Aggregate	34%	66%	65

- 2 in 3 Cornell ORIE PhD graduates whose current sector of employment is known (i.e. 65 of 75 total graduates) are working in industry
- No discernible trend over time (conclusion tentative owing to low number of observations); observed tendency for short-lived academic roles immediately after graduation before moving to industry suggests most recent graduates' sector may not be permanent



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Cornell University's innovation potential

Patent-related indicators

Dr M'hamed El Aisati, Elsevier

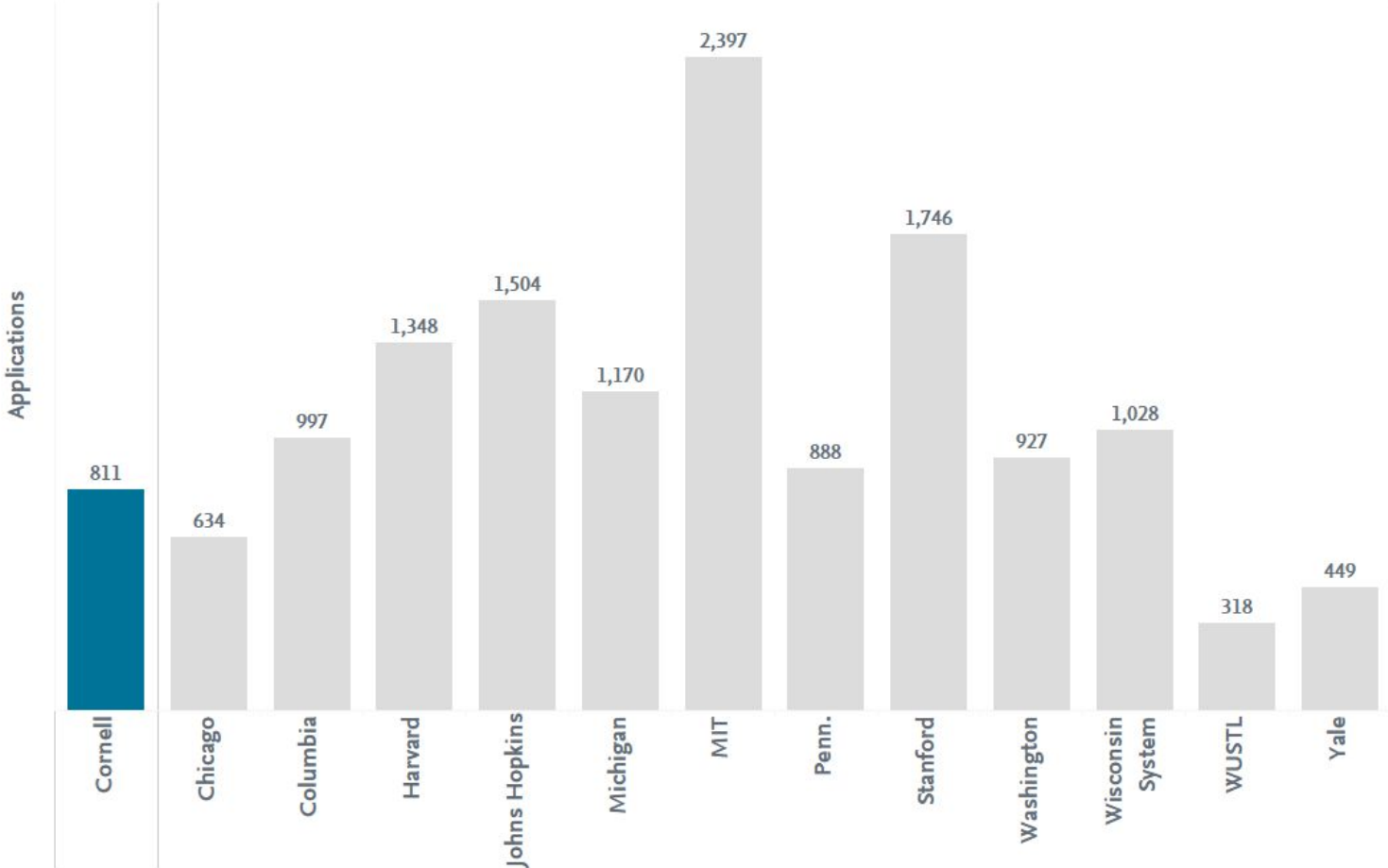
Vice President, Research Analytics and Data Services (RADS); assisted by Dr. Jörg Hellwig, Sr. Research Analyst, RADS

Dr. Alice Li, Cornell University

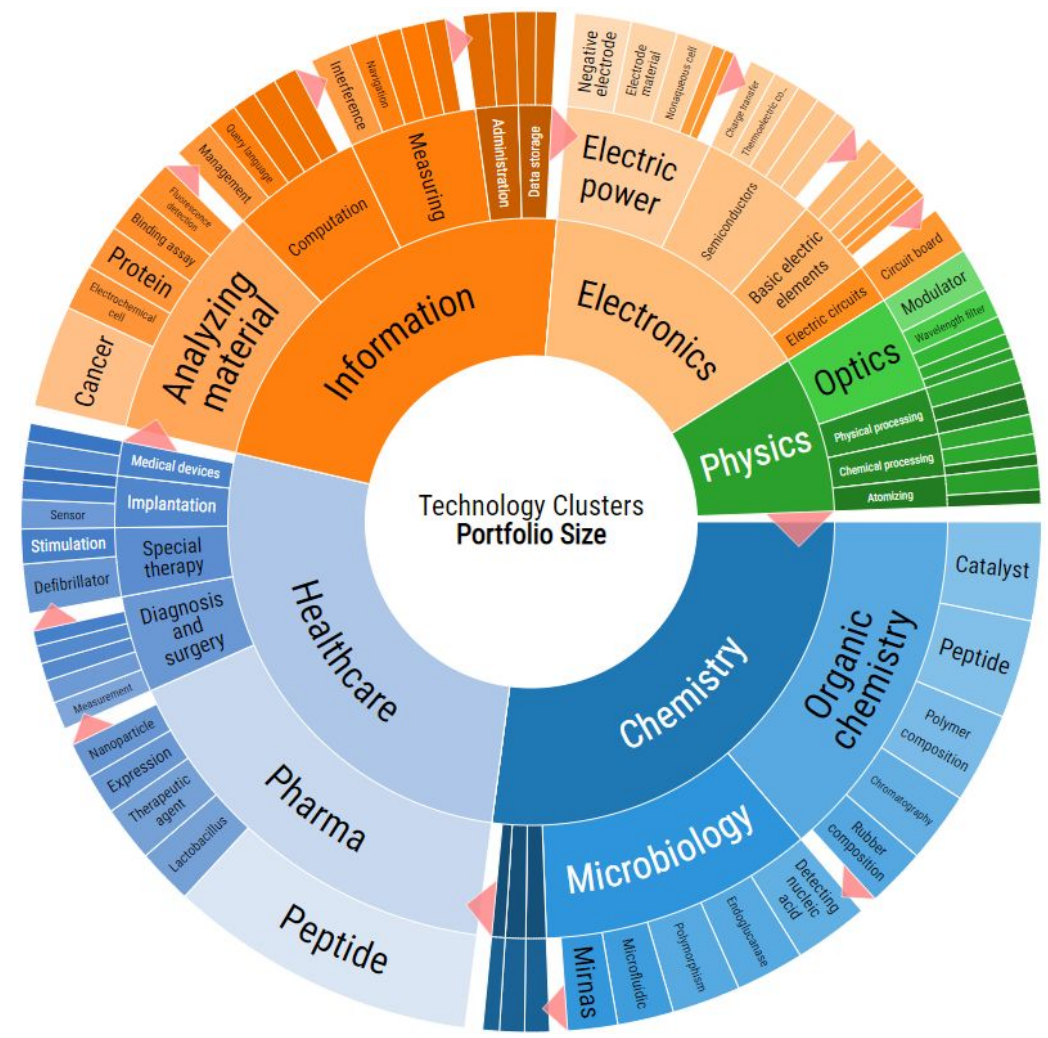
Executive Director, Center for Technology Licensing



US Patent Applications, 2010-2017



Cornell University Patents by Technology Classification, 2010-2017



Technology Matrix



Patents by SDG

Incl. inactive Incl. other IP rights

Owner ▾
Cornell University Add...
AND

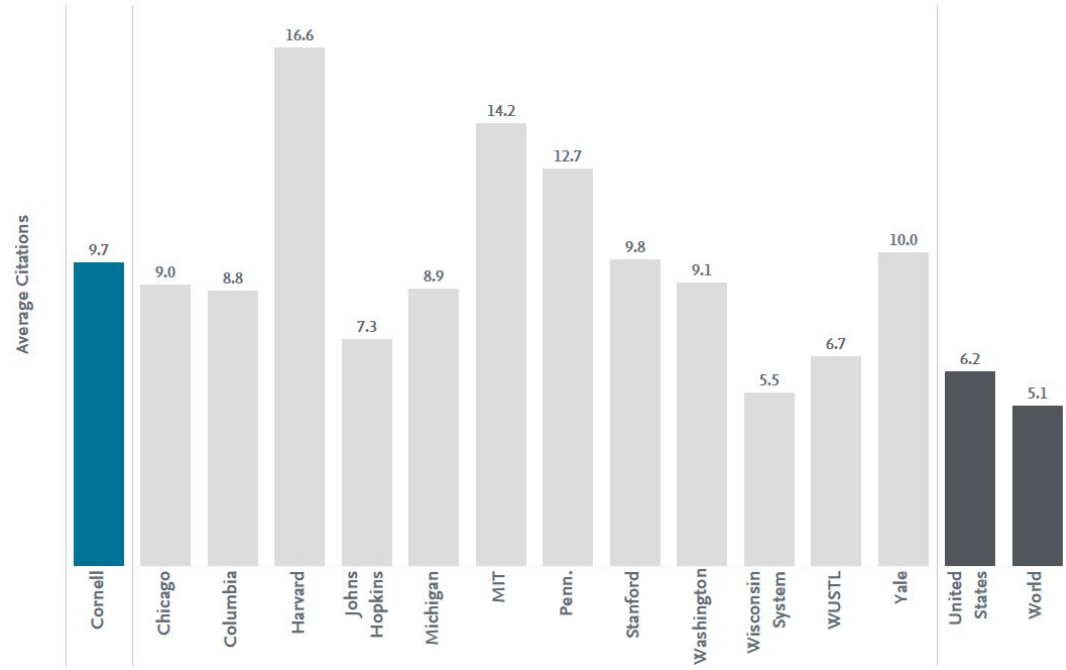
Filing Date ▾

1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020

From 01/01/2010 To Today



Patent-patent citations



Summary



1. US universities can enhance their societal impact and better communicate it by purposeful selection of research projects and partnerships that address local challenges.
2. Universities can increasingly make explicit choices on their local and global impact priorities informed by data and analytics as illustrated with patent and alumni data.
3. Creating societally-driven research agendas and resulting narratives to complement traditional curiosity-driven research agendas enables universities to communicate the value of their entire research enterprise to the public more effectively.



Thank you

Q & A

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