Research Methodology: Lecture 9

Palash Sarkar

Applied Statistics Unit
Indian Statistical Institute, Kolkata
India
palash@isical.ac.in



Miscellaneous Topics

- Patents.
- Research funding.
- Bibliometrics.
- Recognition: awards, prizes and fellowships.
- Politics in the research environment.



Patents

- Patent: a form of intellectual property.
- Exclusive rights for an invention.
  - Patented documents are publicly available.
  - Patenting is not about keeping inventions secret.
  - Patenting is supposed to promote research.
- Patenting versus publication.
  - Patenting an idea does not preclude publication.
  - There are many well known papers which have associated patents.
  - It is usually required to apply for a patent before (or, maybe within a few months of) submitting for publication; exact rules need to be verified.



Patents

- Patent: a form of intellectual property.
- Exclusive rights for an invention.
  - Patented documents are publicly available.
  - Patenting is not about keeping inventions secret.
  - Patenting is supposed to promote research.
- Patenting versus publication.
  - Patenting an idea does not preclude publication.
  - There are many well known papers which have associated patents.
  - It is usually required to apply for a patent before (or, maybe within a few months of) submitting for publication; exact rules need to be verified.



Patents

- What can be patented?
  - Not everything can be patented.
  - Some required aspects: new, non-obvious, useful, industrially applicable.
  - Process patent versus product patent.
- How do patents make money?
  - By directly producing (and selling) objects based on the patented idea.
  - By selling/leasing the rights for the inventions to other parties.
- Most patents do *not* make money.
  - A few patents do make a *lot* of money.
- Patent Offices/Servers.
  - United States Patent and Trademark Office: `http://www.uspto.gov/`.
  - Google patent search: `http://www.google.com/patents`.
  - Controller General of Patents Designs and Trademarks: `http://www.ipindia.nic.in/`.



Patents

- What can be patented?
  - Not everything can be patented.
  - Some required aspects: new, non-obvious, useful, industrially applicable.
  - Process patent versus product patent.
- How do patents make money?
  - By directly producing (and selling) objects based on the patented idea.
  - By selling/leasing the rights for the inventions to other parties.
- Most patents do *not* make money.
  - A few patents do make a *lot* of money.
- Patent Offices/Servers.
  - United States Patent and Trademark Office: `http://www.uspto.gov/`.
  - Google patent search: `http://www.google.com/patents`.
  - Controller General of Patents Designs and Trademarks: `http://www.ipindia.nic.in/`.



Patents

- What can be patented?
  - Not everything can be patented.
  - Some required aspects: new, non-obvious, useful, industrially applicable.
  - Process patent versus product patent.
- How do patents make money?
  - By directly producing (and selling) objects based on the patented idea.
  - By selling/leasing the rights for the inventions to other parties.
- Most patents do *not* make money.
  - A few patents do make a *lot* of money.
- Patent Offices/Servers.
  - United States Patent and Trademark Office: `http://www.uspto.gov/`.
  - Google patent search: `http://www.google.com/patents`.
  - Controller General of Patents Designs and Trademarks: `http://www.ipindia.nic.in/`.



The Patenting Process

- Filing a patent.
  - A research paper cannot be directly submitted as a patent.
  - A patent application is a legal document and has to be prepared by an expert from the paper.
- Patent search process.
  - Before a patent is granted, relevant patent databases have to be searched to ensure that the idea has not already been patented.
  - This is also a specialised task.
- Many institutes have specialised cells to help in patenting procedure.
  - IITs, IISc.
- Patent trawling companies.
  - MoUs with institutes/universities.
  - Marginal benefits to individuals.



The Patenting Process

- Filing a patent.
  - A research paper cannot be directly submitted as a patent.
  - A patent application is a legal document and has to be prepared by an expert from the paper.
- Patent search process.
  - Before a patent is granted, relevant patent databases have to be searched to ensure that the idea has not already been patented.
  - This is also a specialised task.
- Many institutes have specialised cells to help in patenting procedure.
  - IITs, IISc.
- Patent trawling companies.
  - MoUs with institutes/universities.
  - Marginal benefits to individuals.



The Patenting Process

- Filing a patent.
  - A research paper cannot be directly submitted as a patent.
  - A patent application is a legal document and has to be prepared by an expert from the paper.
- Patent search process.
  - Before a patent is granted, relevant patent databases have to be searched to ensure that the idea has not already been patented.
  - This is also a specialised task.
- Many institutes have specialised cells to help in patenting procedure.
  - IITs, IISc.
- Patent trawling companies.
  - MoUs with institutes/universities.
  - Marginal benefits to individuals.



The Patenting Process

- Filing a patent.
  - A research paper cannot be directly submitted as a patent.
  - A patent application is a legal document and has to be prepared by an expert from the paper.
- Patent search process.
  - Before a patent is granted, relevant patent databases have to be searched to ensure that the idea has not already been patented.
  - This is also a specialised task.
- Many institutes have specialised cells to help in patenting procedure.
  - IITs, IISc.
- Patent trawling companies.
  - MoUs with institutes/universities.
  - Marginal benefits to individuals.



To Patent or Not to Patent?

- The macro-economic viewpoint.
  - Movement towards knowledge society.
  - Patents contribute to the national wealth of the country.
- The micro-economic viewpoint.
  - Increase personal wealth in a legal manner.
  - Economic incentive for scientific research.
- The ‘moral’ viewpoint.
  - Companies will make money from the research.
  - Permission without fee can be granted for non-commercial usage.



To Patent or Not to Patent?

- Knowledge should be free.
  - ‘Free’ as in freedom versus ‘free’ as in free ticket.
- The purpose of science is to promote the greater good of humanity.
- ‘Misuse’ of patenting system.
  - Taking patents on certain inventions may actually inhibit the progress of science.
  - Scientists lose control over their inventions.
  - Scientific inventions become the possessions of companies/lawyers.
- The patenting system is archaic.
  - It was intended to be good, but, has not ‘evolved’ with progress of society.
  - A major overhaul of the system is required.



Bibliometrics: The Point

"If you can't measure it you can't manage it."

– Standard management jargon.

- Purpose of bibliometrics: to quantifiably measure 'scientific worth'.
- Motivation for bibliometrics: take decisions (manage).
  - Decisions on recruitment/promotion.
  - Decisions on funding.
  - Decisions on awards/fellowships.
  - ...



Bibliometrics: The Point

"If you can't measure it you can't manage it."

– Standard management jargon.

- Purpose of bibliometrics: to quantifiably measure 'scientific worth'.
- Motivation for bibliometrics: take decisions (manage).
  - Decisions on recruitment/promotion.
  - Decisions on funding.
  - Decisions on awards/fellowships.
  - ...



Bibliometrics: Some Measures

- Raw data: number of times a paper is cited by other papers.
  - Rationale: more cited papers are more important.
- (Journal) Impact factor for year $x = A/B$.
  - $A =$ number of times articles published in years $x-1$ and $x-2$ were cited by indexed journals in year x.
  - $B =$ total number of 'citable items' published by that journal in years $x-1$ and $x-2$.
- H-index.
  - An individual has H-index h if h of N papers have at least h citations each, and the other $(N-h)$ papers have less than h citations each.
  - Attempts to capture both number of papers and the number of citations.



Bibliometrics: Some Measures

- Raw data: number of times a paper is cited by other papers.
  - Rationale: more cited papers are more important.
- (Journal) Impact factor for year $x = A/B$.
  - $A =$ number of times articles published in years $x-1$ and $x-2$ were cited by indexed journals in year x.
  - $B =$ total number of 'citable items' published by that journal in years $x-1$ and $x-2$.
- H-index.
  - An individual has H-index h if h of N papers have at least h citations each, and the other $(N-h)$ papers have less than h citations each.
  - Attempts to capture both number of papers and the number of citations.



Bibliometrics: Some Measures

- Raw data: number of times a paper is cited by other papers.
  - Rationale: more cited papers are more important.
- (Journal) Impact factor for year $x = A/B$.
  - $A =$ number of times articles published in years $x-1$ and $x-2$ were cited by indexed journals in year x.
  - $B =$ total number of 'citable items' published by that journal in years $x-1$ and $x-2$.
- H-index.
  - An individual has H-index h if h of N papers have at least h citations each, and the other $(N-h)$ papers have less than h citations each.
  - Attempts to capture both number of papers and the number of citations.



Bibliometrics: Some Measures

- G-index.
  - Given a set of articles ranked in decreasing order of the number of citations that they received, the G-index is the (unique) largest number g such that the top g articles together received at least g^2 citations.
  - Axiomatic characterisation by Woeginger (2008).
- Sources.
  - Raw Data: Google Scholar, `scholar.google.com`
  - Calculation of indexes (for free): `http://quadsearch.csd.auth.gr/`
  - Possible to find data/indexes for any individual.



Bibliometrics: Some Measures

- G-index.
  - Given a set of articles ranked in decreasing order of the number of citations that they received, the G-index is the (unique) largest number g such that the top g articles together received at least g^2 citations.
  - Axiomatic characterisation by Woeginger (2008).
- Sources.
  - Raw Data: Google Scholar, `scholar.google.com`
  - Calculation of indexes (for free): `http://quadsearch.csd.auth.gr/`
  - Possible to find data/indexes for any individual.



Bibliometrics: The Counter Point

"Not everything that can be counted counts, and not everything that counts can be counted."

– Albert Einstein

- Is counting citations a good method of measuring 'scientific worth'?
- Is it possible to compare individuals across areas based on number of citations?
- Should the size of the relevant 'scientific community' be taken into account?
- Are decisions based on 'ad-hoc' citation measures better than 'subjective' decisions?
- ...



Bibliometrics: The Counter Point

"Not everything that can be counted counts, and not everything that counts can be counted."

– Albert Einstein

- Is counting citations a good method of measuring 'scientific worth'?
- Is it possible to compare individuals across areas based on number of citations?
- Should the size of the relevant 'scientific community' be taken into account?
- Are decisions based on 'ad-hoc' citation measures better than 'subjective' decisions?
- ...



Bibliometrics: The Counter Point

"Not everything that can be counted counts, and not everything that counts can be counted."

– Albert Einstein

- Is counting citations a good method of measuring 'scientific worth'?
- Is it possible to compare individuals across areas based on number of citations?
- Should the size of the relevant 'scientific community' be taken into account?
- Are decisions based on 'ad-hoc' citation measures better than 'subjective' decisions?
- ...



Bibliometrics: The Counter Point

"Not everything that can be counted counts, and not everything that counts can be counted."

– Albert Einstein

- Is counting citations a good method of measuring 'scientific worth'?
- Is it possible to compare individuals across areas based on number of citations?
- Should the size of the relevant 'scientific community' be taken into account?
- Are decisions based on 'ad-hoc' citation measures better than 'subjective' decisions?
- ...



Bibliometrics: The Counter Point

"Not everything that can be counted counts, and not everything that counts can be counted."

– Albert Einstein

- Is counting citations a good method of measuring 'scientific worth'?
- Is it possible to compare individuals across areas based on number of citations?
- Should the size of the relevant 'scientific community' be taken into account?
- Are decisions based on 'ad-hoc' citation measures better than 'subjective' decisions?
- ...



Awards, Prizes and Fellowships: The Point

- ‘Official’ recoginition of outstanding works and outstanding scientists.
  - Directs the attention of non-specialists and the general public to ‘important’ work.
  - Mark out certain people as being academically ‘important’.
- Incentive.
  - Researchers may set personal goals.
  - Foster research in areas which have more awards.
- Administrative decisions.
  - Recruit/promote people who have (more) awards.
  - Request advice from ‘important’ people.
  - Give awards to those who already have some.



Awards, Prizes and Fellowships: The Point

- ‘Official’ recoginition of outstanding works and outstanding scientists.
  - Directs the attention of non-specialists and the general public to ‘important’ work.
  - Mark out certain people as being academically ‘important’.
- Incentive.
  - Researchers may set personal goals.
  - Foster research in areas which have more awards.
- Administrative decisions.
  - Recruit/promote people who have (more) awards.
  - Request advice from ‘important’ people.
  - Give awards to those who already have some.



Awards, Prizes and Fellowships: The Point

- ‘Official’ recoginition of outstanding works and outstanding scientists.
  - Directs the attention of non-specialists and the general public to ‘important’ work.
  - Mark out certain people as being academically ‘important’.
- Incentive.
  - Researchers may set personal goals.
  - Foster research in areas which have more awards.
- Administrative decisions.
  - Recruit/promote people who have (more) awards.
  - Request advice from ‘important’ people.
  - Give awards to those who already have some.



Awards and Prizes: Types

- Best paper awards from journals/conferences.
- International awards.
  - Some have age limitations; some are given for particular work; some are given for ‘lifetime’ achievement.
- National awards.
  - Government: DST, CSIR.
  - Non-government: Infosys, Birla awards, ...
- Procedures.
  - Closed door: consideration through nomination.
  - Open door: applications are solicited.



Awards and Prizes: Types

- Best paper awards from journals/conferences.
- International awards.
  - Some have age limitations; some are given for particular work; some are given for ‘lifetime’ achievement.
- National awards.
  - Government: DST, CSIR.
  - Non-government: Infosys, Birla awards, ...
- Procedures.
  - Closed door: consideration through nomination.
  - Open door: applications are solicited.



Awards and Prizes: Types

- Best paper awards from journals/conferences.
- International awards.
  - Some have age limitations; some are given for particular work; some are given for ‘lifetime’ achievement.
- National awards.
  - Government: DST, CSIR.
  - Non-government: Infosys, Birla awards, ...
- Procedures.
  - Closed door: consideration through nomination.
  - Open door: applications are solicited.



Awards and Prizes: Types

- Best paper awards from journals/conferences.
- International awards.
  - Some have age limitations; some are given for particular work; some are given for ‘lifetime’ achievement.
- National awards.
  - Government: DST, CSIR.
  - Non-government: Infosys, Birla awards, ...
- Procedures.
  - Closed door: consideration through nomination.
  - Open door: applications are solicited.



Fellows

- A form of recognition.
- International bodies.
  - The dynamics of members and fellows.
- National academies: six in number.
  - Each academy selects a group of new fellows annually.
  - Closed door policy: consideration through nomination.
  - Decisions based on ‘elections’.
  - No retirement.



Fellows

- A form of recognition.
- International bodies.
  - The dynamics of members and fellows.
- National academies: six in number.
  - Each academy selects a group of new fellows annually.
  - Closed door policy: consideration through nomination.
  - Decisions based on ‘elections’.
  - No retirement.



Fellows

- A form of recognition.
- International bodies.
  - The dynamics of members and fellows.
- National academies: six in number.
  - Each academy selects a group of new fellows annually.
  - Closed door policy: consideration through nomination.
  - Decisions based on ‘elections’.
  - No retirement.



Awards, Prizes and Fellowships: The Counter Point

"It's also good to remember that professional mathematics is not a sport... The objective in mathematics is not to obtain ... the highest number of prizes and awards; instead, it is to increase understanding of mathematics ... and to contribute to its development and applications. "

– Terence Tao

- Puts undue emphasis on a few works.
- Creates a 'cult of genius'.
  - Progress in science is more cumulative.
- Diverts attention from nascent fields of work.
  - These fields may not have associated awards.
- ...



Awards, Prizes and Fellowships: The Counter Point

"It's also good to remember that professional mathematics is not a sport... The objective in mathematics is not to obtain ... the highest number of prizes and awards; instead, it is to increase understanding of mathematics ... and to contribute to its development and applications. "

– Terence Tao

- Puts undue emphasis on a few works.
- Creates a 'cult of genius'.
  - Progress in science is more cumulative.
- Diverts attention from nascent fields of work.
  - These fields may not have associated awards.
- ...



Research Funding: Why?

- Sources.
  - Governmental agencies: main provider of research funds.
  - Industry: may look for patents.
- Tangible benefits.
  - Additional funding for equipments and travel.
  - Financial incentive: makes research career more attractive.
- Intangible benefits.
  - Interactions with government and industry people.
  - Learn about what is going on ‘outside’ academics.
  - Your research may actually be used!
- Social responsibility: helping solve governmental problems is a way of giving back to society.
  - This is not to say that governmental funding of salaries/fellowships is not justified.



Research Funding: Why?

- Sources.
  - Governmental agencies: main provider of research funds.
  - Industry: may look for patents.
- Tangible benefits.
  - Additional funding for equipments and travel.
  - Financial incentive: makes research career more attractive.
- Intangible benefits.
  - Interactions with government and industry people.
  - Learn about what is going on 'outside' academics.
  - Your research may actually be used!
- Social responsibility: helping solve governmental problems is a way of giving back to society.
  - This is not to say that governmental funding of salaries/fellowships is not justified.



Research Funding: Why?

- Sources.
  - Governmental agencies: main provider of research funds.
  - Industry: may look for patents.
- Tangible benefits.
  - Additional funding for equipments and travel.
  - Financial incentive: makes research career more attractive.
- Intangible benefits.
  - Interactions with government and industry people.
  - Learn about what is going on ‘outside’ academics.
  - Your research may actually be used!
- Social responsibility: helping solve governmental problems is a way of giving back to society.
  - This is not to say that governmental funding of salaries/fellowships is not justified.



Research Funding: Why?

- Sources.
  - Governmental agencies: main provider of research funds.
  - Industry: may look for patents.
- Tangible benefits.
  - Additional funding for equipments and travel.
  - Financial incentive: makes research career more attractive.
- Intangible benefits.
  - Interactions with government and industry people.
  - Learn about what is going on ‘outside’ academics.
  - Your research may actually be used!
- Social responsibility: helping solve governmental problems is a way of giving back to society.
  - This is not to say that governmental funding of salaries/fellowships is not justified.



Governmental Funding Agencies

- Department of Information Technology.
- Department of Science and Technology.
- Defence Research and Development Organisation.
- Indian Space Research Organisation.
- Other agencies.

- Some agencies have advertised call for project proposals, e.g. DIT, DST.
  - These can typically be more open-ended.
- For other agencies, you need to have working relations with relevant scientists.
  - These are typically given for specific problems.



Governmental Funding Agencies

- Department of Information Technology.
- Department of Science and Technology.
- Defence Research and Development Organisation.
- Indian Space Research Organisation.
- Other agencies.

- Some agencies have advertised call for project proposals, e.g. DIT, DST.
  - These can typically be more open-ended.
- For other agencies, you need to have working relations with relevant scientists.
  - These are typically given for specific problems.



Politics in the Research Environment

- Publication of research papers.
  - Priority claims.
  - Blocking papers of other authors.
  - Publishing more of one's own papers in a particular journal or conference.
- Employment.
  - Backing certain candidates.
  - Blocking certain other candidates.
- Awards, fellowships and funding.
  - Lobbying 'right' people.
  - Preventing others from obtaining 'recognition'.



Politics in the Research Environment

- Publication of research papers.
  - Priority claims.
  - Blocking papers of other authors.
  - Publishing more of one's own papers in a particular journal or conference.
- Employment.
  - Backing certain candidates.
  - Blocking certain other candidates.
- Awards, fellowships and funding.
  - Lobbying 'right' people.
  - Preventing others from obtaining 'recognition'.



Politics in the Research Environment

- Publication of research papers.
  - Priority claims.
  - Blocking papers of other authors.
  - Publishing more of one's own papers in a particular journal or conference.
- Employment.
  - Backing certain candidates.
  - Blocking certain other candidates.
- Awards, fellowships and funding.
  - Lobbying 'right' people.
  - Preventing others from obtaining 'recognition'.

