Robotics Research Review 2

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Based on and including material from M.v.Rossum

Last time:

- Identify relevant papers: (see below)

- Keep notes on each paper

- Weave these into a story

- Attend related seminars (EPS, IPAB, ...)

- Write your report (≈10 pages, 3000-4000 words)

- Submit by 4pm, 25th February 2019 no extensions

- Submit via e-mail to both your supervisor and to michael.herrmann@ed.ac.uk

Telling a story

- Literature survey is part of *motivation*

- How did this field *develop*?

- How did it *start*?

- What are the *rival approaches*?

- How do pieces of work *relate*?

- Where are we *now*?

- What remains *to be done*?

- What are the *hot topics*?

5-Paragraph Essay
("Hamburger" essay)

1. Introduction: Motivation, topic, hypothesis

2. Narration: Evolution of the topic, literature overview, alternative hypotheses

3. Affirmation: evidence and argument in favour

4. Negation: discussion and refutation of arguments against and of alternatives

5. Conclusion: Summary and connection to larger issues

8-Legged Essay

Chinese tradition (and a modern interpretation)

1. Opening (topic)

2. Amplification (motivation)

3. Preliminary exploitation (literature)

4. Initial argument (results for trivial case)

5. Central argument (results for interesting case)

6. Latter argument (results for ambitious case)

7. Final argument (conclusion, assuming discussion was included already in 4.-6.)

8. Conclusion (outlook)

Methods, Models, Soft- & Hardware
(important aspect that is often not explicit in the classical schemes)

- Be brief about established methods (Refs!)
  - advantages and drawbacks (several dimensions for evaluation)
  - this evaluation helps to justify your own approach
  - if used, indicate which variant & justify your choice
- Be detailed about methods you have developed
  ⇨ Reproducibility
- Comparison of methods can continue as part of Results and/or Discussion

RRR as part of a thesis project

- Literature review
- Specification of a direction, goals and methods
- Justification of the approach
  - filling a gap that was identified in the literature
  - similar to examples from the literature
  - a new combination of existing approaches
  - application of a existing approach to a new domain
  - extension, generalisation, removal of assumption
  - improvement of existing approaches

RRR Structure
(to be adapted to your project)

- Introduction (motivation)
- State of the art (literature review)
- Hypothesis (including a justification and some preliminary expectations)
- Discussion (brief, but important!)
  - Approach (methods)
  - Research plan (first steps, overview)
  - Evaluation (criteria)
  - Discussion (potential difficulties, fall-back options)
- Conclusion (impact, outlook)

Marking (Theses)

- Basic criteria
  - Understanding of the problem
  - Completion of the project
  - Quality of the work
  - Quality of the dissertation
- Additional criteria
  - Knowledge of the literature
  - Critical evaluation of previous work
  - Critical evaluation of own work
  - Justification of choices made
  - Solution of any conceptual problems
  - Amount of work
- Exceptional criteria

Marking (Theses)

- If everything is just fine, you'll get 60-70%
- Are you aiming at more than this?
  - outstanding merit
  - indicating routes beyond the state of the art while still remaining realistic
  - work towards publishable results
  - public interest ("impact")
  - excellent format, style and argument
- If basic or additional criteria are not met, the exceptional criteria won't help you

Marking RRR
(adapted from the DTC Neuroinformatics guidelines)

- Background explanation / Context

- Description of relevant methods and aims

- Conclusions lead to a feasible project

- State of the art, novelty of the project

- Writing - Clarity
of expression and
argument, Style
and appearance

Inadequate (<50%),
adequate(>50%),
good (>60%),
very good (>70%),
outstanding (>80%)

RRR mark is the average over the five values

Marking RRR

Potential implicit criteria (may overlap with formal criteria):

- Evidence of knowledge, scholarship
- Evidence of ambition, interest, curiosity
- Evidence for a good understanding of the problem
- Amount of productive work (feasibility becomes obvious by presenting first results)
- Independence (does not exclude asking many questions!)
- Professionality of the report

What makes a good report?

A well written report will demonstrate your ability to:

- Understand the purpose of the report brief and adhere to its specifications

- Gather, evaluate and analyse relevant information

- Structure material in a logical and coherent order

- Present your report in a consistent manner according to the instructions of the report brief

- Make appropriate conclusions that are supported by the evidence and analysis of the report

- Make thoughtful and practical recommendations where required

http://www2.le.ac.uk/offices/ld/resources/writing/writing-resources/reports

Good writing style

- Write in paragraphs which have one main point that you introduce, expand on, and summarise

- Avoid using colloquialisms and informality in academic writing

- Write words out in full, for instance use 'do not' instead of 'don't'

- Don't try to be funny, ironic, sarcastic, … , but you can be lapidary

- Do use appropriate technical terms, but try to avoid jargon –

  - consider who is likely to read your report and whether they will understand the terms you use

  - it doesn't help to preface any uncommon term by a "so-called" (use "so-called" if you don't fully agree)

Format, style and argument:

"If it's worth doing, it's worth overdoing."   (Ayn Rand)

- consistency, Consistence, con-sistency

- Everything should be made as simple as possible, but no simpler

- Referentiality

- Figures!

- Lists of symbols, abbreviations, figures, etc.

- Preface, appendices, footnotes, dedication, acknowledgements, declaration, margin notes, 0th subsections, lists, ...

Why am I Telling this?

- Use Capitalisation consistently

- Usecorrect   spacing ?[61]Always .

- Always more than one subsection per section

    – and more than one subitems per item

- Use crossreferences, e.g. to figures, see Fig.
  1   (use unbreakable spaces)

- Use correct "`´´Quotation marks'<<

Figure 1: Example of a figure caption for a Figure showing an Example of
a Figure (stating the obvious?) produced using the Fontwork Gallery.

- Avoid "widows"

- and "orphans"

• bullet points

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Typography

- Use *very* few `fonts` `per` document

- Hyphens "-" should not be confused with dashes (en-dash "–", em-dash "---") or minus signs

- \sloppy to avoid text that extends beyond the margin of the text of the

- Display style for formulas unless the formula

$$x=x \hspace{4cm} (1)$$

  is trivial

- Who was Kate Turabian?

Graduate school dissertation secretary at the University of Chicago (1930-58)

Kate L. Turabian was our trusted guide and mentor, the absolute authority, the one who knew all there was to know about the strange world of proper term papers....

A Manual for Writers was one of the first books we bought in college and it was one of the only books we kept with us through all four years and probably beyond. To write a term paper without a well-worn copy of Turabian handy was unthinkable. Our writing on term papers might be weak, our research haphazard, our insights sophomoric, but, thanks to Kate L. Turabian, our footnotes could always be absolutely flawless.

Numbers and variables

- Aim at producing quantitative results
- Analyse dependency on parameters
- Don't use tables to present data (unless a figure would look silly)
- Use a reasonable numerical precision
- Use errorbars to indicate standard deviations
- Determine significance levels
- Discuss outliers explicitly
- Keep your notation simple, but follow standards
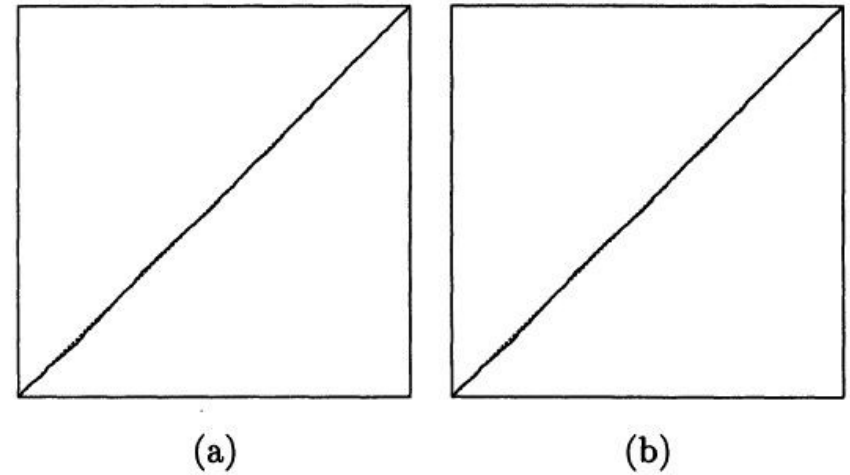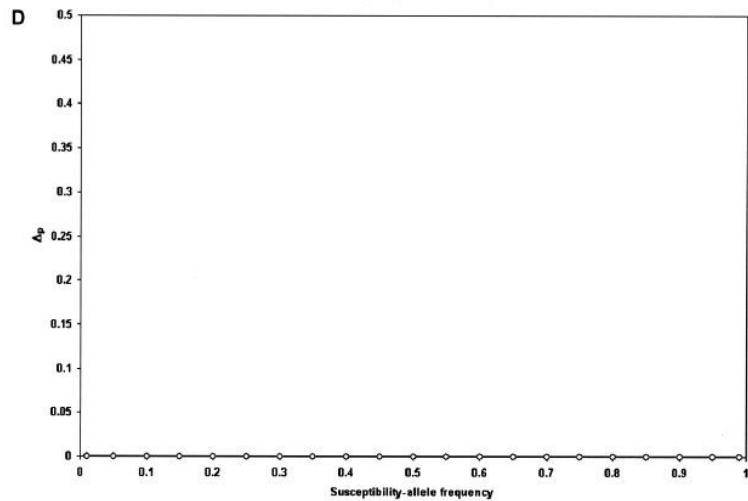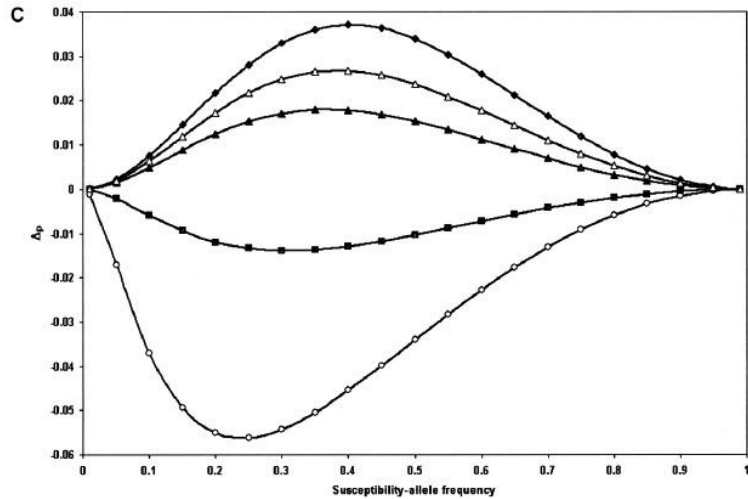- Use fonts consistently (for variables, e.g.)

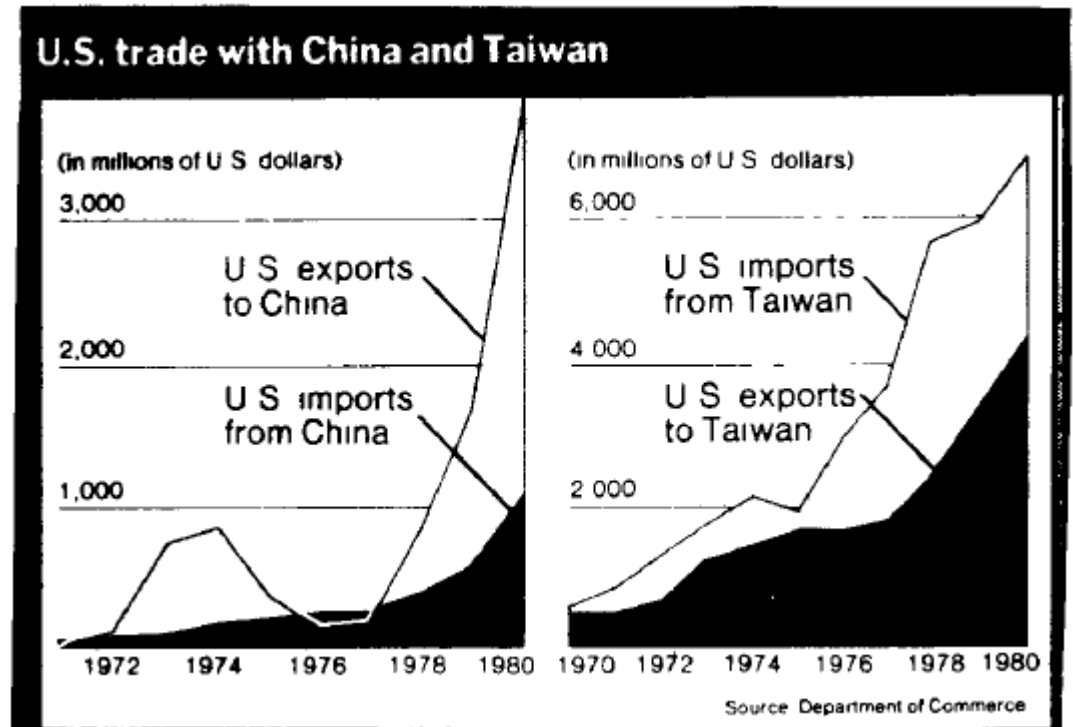# Tables and Figures

Figure 1. SRQ Plots of T_i/T_n (Vertical Axes) Against i/n (Horizontal Axes) for the Gibbs Sampler (a) and an Alternating Gibbs/Independence Sampler (b) for the Pump Failure Data Based on Runs of Length 5,000. Lines through the origin with unit slope are shown dashed; axis ranges are from 0 to 1 for all axes.
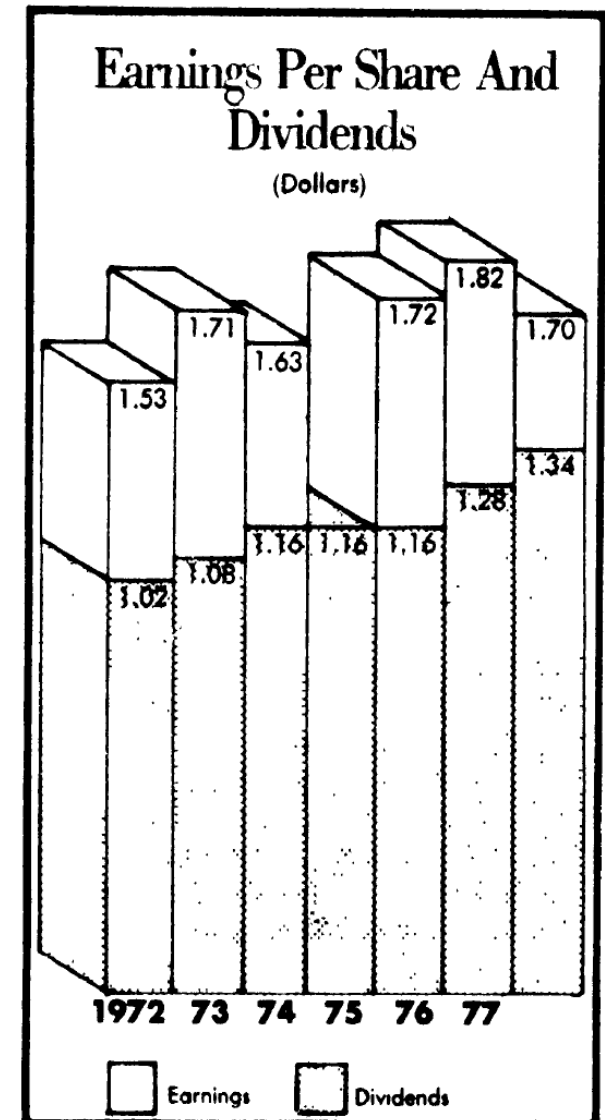

U.S. trade with China and Taiwan

Source: see next page

Rules for how to display data badly

Howard Wainer, Am. Stat. 38, 1984

1) Minimise data density

2) Hide what data you show

3) Ignore the visual metaphor

4) Only order matters

5) Graph data out of context

6) Change scale in mid-axis

7) Emphasise the trivial

8) Jiggle the baseline

9) Order alphabetically

10) Label incompletely, ambiguously ...

11) More decimal places, more dimensions

12) If it used to work well think about alternatives

Earnings Per Share And Dividends (Dollars)

1972 73 74 75 76 77

Earnings   Dividends

Tables and Figures

Table 5

Simulation results for using full data, CRs only, and proposed method under four missing mechanisms

Method	Bias[a] $(\hat{\beta}_W)$	Bias[a] $(\hat{\beta}_X)$	Variance[b] $(\hat{\beta}_W)$	Variance[b] $(\hat{\beta}_X)$	95% CI[c] $(\hat{\beta}_W)$	95% CI[c] $(\hat{\beta}_X)$
(M.1) $P(R = 1) = 0.66$						
Full	0.01346	0.02229	0.04008	0.03685	0.955	0.950
Comp	0.03062	−0.003561	0.1149	0.06732	0.960	0.955
Impu	0.01431	0.021	0.04088	0.05169	0.980	0.975
(M.2) logit $P(R = 1) = 2Y$						
Full	0.007908	−0.02116	0.03838	0.03624	0.975	0.925
Comp	0.01945	0.07096	0.107	0.06581	0.960	0.950
Impu	0.006966	0.01597	0.04227	0.05226	0.975	0.985
(M.3) logit $P(R = 1) = 2X$						
Full	0.007908	−0.02116	0.03838	0.03624	0.975	0.925
Comp	0.01225	0.0589	0.08856	0.06818	0.980	0.975
Impu	0.009563	−0.04699	0.03865	0.04923	0.985	0.970
(M.4) logit $P(R = 1) = X + Y$						
Full	0.01346	0.02229	0.04008	0.03685	0.955	0.950
Comp	0.02404	1.613	0.1102	0.08202	0.955	0.580
Impu	0.01814	0.08289	0.0578	0.06075	0.955	0.970

[a] Bias $= (\hat{\beta} - \beta_0)/\beta_0$.

[b] Simulation variance.

[c] Confidence interval using jackknife standard error.

Consequences of erudite vernacular utilized irrespective of necessity: problems with using long words needlessly

Daniel M. Oppenheimer*

Cited in: Richard Threlfall (2013) Mind your Language! A Very Brief Guide to Language Usage in Scientific Writing (1) Asian Journal of Organic Chemistry, Wiley-VCH Verlag.

Mind your Language!

"Functionalized polythiophene compound 1 exhibits attractive electronic properties and shows fluorescence due to functionalized polythiophene 1 possessing a benzyl group at the C5 position. This synthetic methodology represents both a significant advance over previous reports of functionalized polythiophene compounds and opens new avenues towards developing novel photoexcitable oligomers."

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Mind your Language!

- compound – stating the obvious, can be omitted.
- exhibits – is this an art gallery or a chemical compound?
- shows (fluorescence) – to who?
- due to – only for concepts of time, where something is due to arrive, happen, and so on.
- functionalized polythiophene 1 – unnecessary repetition is common and unnecessary repetition takes away the focus from the subject through unnecessary repetition.
- possessing – avoid applying human traits to chemicals!
- methodology – is the study or description of methods, not the method itself.
- represents – only for things that are actually representative, for everything else, "is" works just as well.
- both – usually unnecessary and does not add anything to the meaning of the sentence.
- significant advance over previous reports – what advance? Be specific!
- functionalized polythiophene compounds – unnecessary repetition again!
- a opens new avenue towards – sounds grand, but non-specific metaphors generally do not add anything to the understanding of the concept.
- novel – redundant – of course things that haven't been developed yet are going to be novel! Another note on this word is that everything that is reported in a scientific journal should be novel, so it is not necessary to explicitly use it in your title/abstract/writing in general.

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"Functionalized polythiophene 1 has useful electronic properties and fluoresces because it has a benzyl group at the C5 position. Our synthetic method has three fewer steps than those reported previously and can potentially be used for further development of photoexcitable oligomers."

Mind your Language!

"Any intelligent fool can make things bigger, more complex, and more violent. It takes a touch of genius – and a lot of courage – to move in the opposite direction."

Ernst Friedrich Schumacher, 1911–1977, also wrote the book: "Small Is Beautiful: A study of economics as if people mattered" Blond & Briggs, 1973.

Cited in: Richard Threlfall (2013) Mind your Language! A Very Brief Guide to Language Usage in Scientific Writing (1) Asian Journal of Organic Chemistry, Wiley-VCH Verlag.

Dare to use concise terms*

Instead of: Write:

possess   have

sufficient   enough

utilise   use

demonstrate   show

assistance   help

terminate   end

*Unless the more complex terms have a specific meaning.

http://www.columbia.edu/cu/biology/ug/research/paper.html

Dare to use simple expression

Instead of:

Write:

prior to

before

due to the fact that

because

in a considerable number of cases

often

the vast majority of

most

during the time that

when

in close proximity to

near

it has long been known that   I'm too lazy to look up the reference

http://www.columbia.edu/cu/biology/ug/research/paper.html

Dangling participles, succinctness is my goal.

- Sleeping in mine orchard, a serpent stung me. (Hamlet)

- Flitting gaily from flower to flower, the football player watched the bee.

- Analysing its capabilities, the robot outperformed alternative systems

- A dangling modifier walks into a bar. After finishing a drink, the bartender asks it to leave.

- A team led by Dr Craig Smith from the University of Hawaii at Manoa found the crabs using a remotely operated submersible.

- Hastily summoning an ambulance, the corpse was taken to the mortuary.

More information

- Seek feedback from peers
- Read the MSc project guide

  http://www.inf.ed.ac.uk/teaching/courses/diss/guide.html

  most of your questions are answered there

- If you have questions
  - ask your Mentor
  - make an appointment to see me