PhD - a bird’s eye view

Research: doing and writing

Vijay Kartik
15.05.2018
1. My initial dreams
2. Useful things I did
3. More useful things
4. Reusing content in the thesis
5. General research writing tips
My initial dreams
1. Learn *everything* about (new) PhD topic
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2. Brilliant brainwave
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3. Spread the idea a.k.a Publish articles (maybe 10-20)
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3. Spread the idea a.k.a Publish articles (maybe 10-20)
4. BTW, also write some thesis chapters
1. Learn *everything* about (new) PhD topic
2. Brilliant brainwave
3. Spread the idea a.k.a Publish articles (maybe 10-20)
4. BTW, also write some thesis chapters
5. Applause from everyone
1. Learn *some* parts of the PhD topic
Reality is slightly different

1. Learn *some* parts of the PhD topic
2. Brilliant brainwave
1. Learn some parts of the PhD topic
2. Brilliant brainwave
3. Learn more parts around the PhD topic
1. Learn *some* parts of the PhD topic
2. Brilliant brainwave
3. Learn more parts around the PhD topic
4. Mini-brainwaves - work on them and publish
Reality is slightly different

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5. Go to Step 3
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6. Ah, it’s almost 4 years already??
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3. Learn more parts around the PhD topic
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6. Ah, it’s almost 4 years already??
7. WRITE THE THESIS
Reality is slightly different

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8. Go to step 7
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8. Go to step 7
9. Go to step 7
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11. Submit, defend, hunt for jobs
Useful things I did
1. Use a reference manager
Useful things I did

1. Use a reference manager
2. Take fairly regular notes of experiments
Equivalently, if we take $R = F \Phi^T$, then:

$$y^1 = R \Phi x + R n$$

$$= F \Phi^T \Phi x + F \Phi^T n$$

$$= F S Z \Phi \Gamma G Z S x + F S Z \Phi \Gamma G n$$

$$y^1' = \Phi^T x + n'^1$$

$$C_n' = \langle n', n'^T \rangle = (F S \Phi \Gamma G Z S F^T)$$

$$= F S \Phi \Gamma G Z S F^T \cdot c^2.$$

If $C_n'$ is diagonal, then:

Data term $= n'^T C_n'^{-1} n' = n'^T D^{-1} n'$

$$= \| D^{-1/2} n' \|_2^2$$

Define a new optimization problem:

$$(\text{min})$$

Now we take $R = F Z \Phi^T$

Then:

$$y^1 = R \Phi x + R n$$

$$= F Z S \Phi \Gamma G Z S x + F Z \Phi \Gamma G n.$$

$$y^1' = \Phi^T x + n'^1$$

$$C_n' = \langle n', n'^T \rangle = F Z S \Phi \Gamma G Z S F^T \cdot c^2.$$

If $C_n'$ is diagonal, then:

Data term $= n'^T C_n'^{-1} n' = n'^T D^{-1} n'$

$$= \| D^{-1/2} n' \|_2^2$$

$m$ is some proportion of $N$, $m = \lambda N$

$$O(\lambda N) = O(\lambda N^2)$$

$m$ is some proportion of $\lambda N$, $m = \lambda N$

$$O(\lambda N^2) = O(\lambda N^2)$$
Compute complexity of computing $C_n$, the eigenvalue decomposition using the diagonal approximation.

Because complexity of computing the eigenvalue decomposition of a symmetric matrix is $O(n^3)$.

Instead of promoting $\phi = G\phi$, then possible $\epsilon = F\phi$ with $\|y - \phi\|_2 < C$.

20th 19th

Christine, Lausanne CH

$G$

$G^T$

$\phi$

$C_n$

$\epsilon$

$\phi^T\phi$

$\phi^T$

$G$

$F$

$D$

$\epsilon$

$\phi$

$C$

$245-323-146-8-76$

$G = GFDB$

$\phi^T = B^TDF^TFC^T$

$\phi^T\phi = B^TDF^TFC^TGFDB$

$\phi^T$

$\phi$

$G$

$GFDB$

$\epsilon$

$C_n$

$\phi$

$\phi^T$

$\phi^T\phi$

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$\phi^T$
Useful things I did

1. Use a reference manager
2. Take fairly regular notes of experiments
3. Try different collaborative writing tools
4. Go back and read earlier literature before writing thesis
5. Automate versioning of all research output
6. Automate plotting figures (posters, papers, thesis – everywhere)
7. Multiple backups of ongoing work
8. Pre-emptive copyright permissions on own work
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Automate versioning

[@castor:~/admm/choleskyapprox] griddinggaussian(+11/-10)** ± git branch
diagreduction256images
* griddinggaussian
  master
  nothresholding
  nufftdiagreduction
  randomisedhadamard
  spreadspectrum
  systematicdiscardcols
testhistogrampeakiness
Automate versioning

```
vnkartik@deneb2:choleskyapprox$ git branch
  discardeigenvectors
  fouriergrid2imgsize
  grid2imgsize
  master
  multispectralthresholding
  newcovmatfunc
  randomcoverage
  * sigmaftrial
  zoomskacoverage
```
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More useful things
Useful things I wish I did

1. *Maintain* an organized log (weblog, notebook, tattoos, *anything*)
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2. Actively follow up conference discussions
Useful things I wish I did

1. **Maintain** an organized log (weblog, notebook, tattoos, *anything*)
2. Actively follow up conference discussions
3. **Organize/label data and results** better
1. Maintain an organized log (weblog, notebook, tattoos, *anything*)
2. Actively follow up conference discussions
3. Organize/label data and results better
4. Write up different research methods tried (and possibly failed)
Reusing content in the thesis
Step 1: Write a paper
Step 2: Done. I now have (unpublished) content.

Ideally, I would already start thinking about how much ‘freedom’ I have with my own content.
Questions to ask:

1. Can I retain copyright? (Answer: not always)
2. Can I provide public access to my paper?
3. Can I use text/images from my paper in my thesis?
   • Not to self-plagiarize in another paper!
4. Where do I submit?

P.S.: Sometimes you do not have a say in which journal to publish in (e.g., supervisor decides for you)
Where do I submit?

ARE YOU SURE THIS STUDY IS LEGIT?
Sure, it says it was accepted for publication.
WHERE?
Hmm ... the National Academy of Proceedings.

Source: https://xkcd.com/1847
Reusing published content in a presentation

Check first!

xkcd.com

Randall Munroe
Contact:

orders@xkcd.com -- All store-related email.
press@xkcd.com -- Press questions, etc (may take a long time to get to me).

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Vijay Kartik

to

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Additionally, could you please confirm that uploading the accepted manuscript to the astro-ph website is coherent with the default licence that the proposes to authors for ?

Regards,
Vijay Kartik

to me

Dear Vijay,

Yes it is fine to upload your paper to the astro-ph website https://arxiv.org/

Kind regards,

What rights do I retain as an author?

- The right, after publication by [publisher], to use all or part of the Article and abstract, for their own personal use, including their own classroom teaching purposes;

- The right, after publication by [publisher], to use all or part of the Article and abstract, in the preparation of derivative works, extension of the article into book-length or in other works, provided that a full acknowledgement is made to the original publication in the journal;

- The right to include the article in full or in part in a thesis or dissertation, provided that this not published commercially;
General research writing tips
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2. Have measurable goals
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6. Involve your supervisor
7. Make multiple backups
8. Convince yourself that the deadline is earlier than it actually is
9. Get enough sleep
Questions?
Get the LaTeX source of this presentation from https://github.com/vijaykartik/talk_researchandwriting

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