The Why and How of Releasing Applied-Math Code

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What code would you release?

- Implementation of method proposed in your paper?
- Implementation of competing methods?
- Implementation of basic method in your field?
- Experiment scripts?
- "Research" implementation vs. "professional" implementation.

Documentation!!!

Software environment.
↳ autoconf

Data?
↳ Random number seed
↳ Test cases

Why would you release code?

- Let others use your method?
- Let others replicate your experiment?
- Help others with their research?
- Publicize yourself?
- Push people to work on other problems?
- Get hard-to-publish implementation tricks out into the world.

Want people to make interface.

Usage outside of your field/ academia.

Other people can find bugs.

Why would you NOT release code?

- You plan to make money off of the code?
- You have something to hide?
- You don't want others replicating your results?
- You don't want to appear "2nd place" in other papers?
- You want people to suffer the way you suffered?

Not pretty and would take time.

– Not enough resources to support.

– Bad at programming. (Bugs)

Could someone else use this who isn't me?

E-mail spam.

Specialized hardware?

Design Principles

- “Black box” function:
  - One function that does everything.
  - Good if think users don’t care how it works.
  - Check default parameters on many problems.
    - Non-default parameters exposed through arguments.

Design Principles

- "Modular parts":
  - Many simple with common interfaces.
  - Think carefully about data structures.
  - Good if users need to know how it works.
    - More likely to get user contributions.

- UGM_CRF_NLL_HiddenC.zip: Code by James Atwood giving a mex version of the loss for CRFs with hidden variables.
- UGM_makeClampedPotentialsC.c: A variant that fixes a potential indexing bug (thanks to Manuel Claeys Bouuert).

2014

Here are updates that are not included in the 2011 version of UGM:

- mexAll_hacked: A variant of mexAll from James Atwood for compiling under octave on OS X.

2013

Here are updates that are not included in the 2011 version of UGM:

- hcrf.zip: Code by Konstantinos Bousmalis that uses UGM for the hidden conditional random field model of Quattoni et al. [PAMI, 2007].
- UGM_getEdges.m: Returns a row vector instead of a column vector to increase code readability when using the result.
- UGM_LoopyBP.m: Fixed the NaN caused by an integer-division by nStates in the Matlab version of the code (thanks to Javier Juan Albarracin).
  UGM_getEdges.m function above.
- UGM_Junction.zip: Fixed the junction tree methods to allow nodes to have different numbers of states (thanks to Elad Mezuman). Note that this
  function above.

2012

Here are updates that are not included in the 2011 version of UGM:

- UGM_CRF_NLL_Hidden.m: A variant of *UGM_CRF_NLL.m* that allows hidden/missing values in *Y* (though it is quite slow because I haven't writ
  the value is hidden (thanks to Benjamin Marlin, and especially to Lei Shi).
- CRFcell.zip: The function *UGM_CRFcell_NLL.m*, as well as *example_UGM_OCR.m* which is a **demo showing how to apply UGM to data set**
  numbers of nodes and/or different graph structures, which was by far the most requested feature to add to UGM.
- UGM_Infer_TRBPC.c: Fixed an indexing bug in the message-passing.
- UGM_ChainFwd.m: Fixed the error when running Viterbi decoding on a chain with only one node (thanks to Simon Lacoste-Julien).
- UGM_CRF_PseudoNLL.m: Fixed the indexing problem for the non-mex version of this code (thanks to Natraj Raman).
- UGM_makeEdgeStruct.m: Fixed the error ("Undefined function or method 'prod' for input arguments of type 'int32'.") when calling *prod* with an *ir*

Demos

- Always include a simple demo:
  - Something user can run quickly.
  - Gives obvious visual feedback that code is working.

- Good demos can also replace documentation.

Performance vs. Generality

- Trade-off:
  - Spending time optimizing code for specific problems.
    - Vectorization, multi-core, BLAS, etc.
  - Spending time making code apply to many problems.

Programming Languages

- Many potential users don’t know low-level languages.
  - Matlab/Python interface, even if just to .exe file.
  - High-level languages are compatible across more architectures.

- But high-level languages are slow:
  - Use mex/Cython for slow parts of code.
  - But include ‘slow’ version and compile instructions.

Licensing Options

- Completely-free (FreeBSD):
  - Most publicity, least incomes.
- Non-commercial:
  - Similar level of publicity/income to above.
  - May restrict some important applications.
- License code:
- License binary:

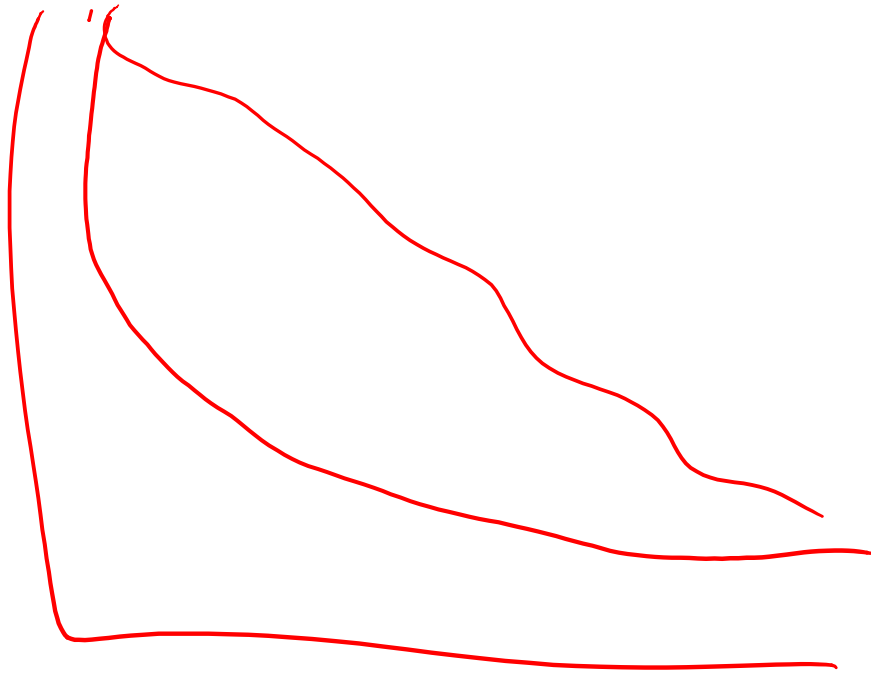
User Interface/Support

- Some users really like a graphical user interface (GUI).
  - Can be great for non-power users.
  - Can help visualize what is going on.

- But power users still want command-line access:
  - You will annoy them without this.

- Provide answers to common problems, e-mail for questions.

The REAL objective function



- Will this code solve my problem?
  1. Google search for keywords.
  2. Go to webpage of code, read description.
  3. Check programming language of code.
  4. Download code.
  5. Unzip and compile.
  6. Try out demo.
  7. Try to formulate my problem in language of code.
  8. Run code on my problem.
  9. Go back to ~~6~~ if problem is not solved (if multiple times, goto 2 or 1).
  10. Done.

- You can lose a huge number users on *any* step:
  - Your objective is optimize time to do 1-9, NOT the time to do ~~7~~.

The REAL objective function

- Optimizing the real objective:
  1. Give code a meaningful name, place it in a Google friendly location.
  2. Webpage should start with high-level description of what method does.
  3. Don't use obscure programming languages (OCAML).
  4. Don't require accepting license or registering e-mail to download.
  5. Make a simple "Makefile": no manually setting paths required.
  6. Give a simple demo: don't assume they will read everything.
  7. Make it easy to input new problems to code.
  8. Use a state-of-the-art-ish method.
  9. Give users a list of "common problems".

Git