Fairly sharing the costs of reproducibility

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What's my point?

We talk about reproducibility

Progress and precedent

But still a long way to go.

There's something in the way:

Cost (not monetary)

Authors are unfairly burdened

What's my point?

Assess costs w/ open eyes and mind

Let's find a fair way to share costs

Or, we can keep talking about reproducibility just like we talk about global warming, reducing air pollution, protecting wildlife, preserving rain forests, ...

Nature of modern scholarship forces the issue

We come here to publish and share our research results

from Latin *publicare* "make public," from *publicus*

10 page PDF + suppl. materials (static, archived)

Except for theory/model papers, we don't have solely hand-drawn figures: claims supported by **computational** results

> "An article about computational science in a scientific publication is not the scholarship itself, it is merely advertising of the scholarship. The actual scholarship is the complete software development environment and the complete set of instructions which generated the figures." --David Donoho on WaveLab

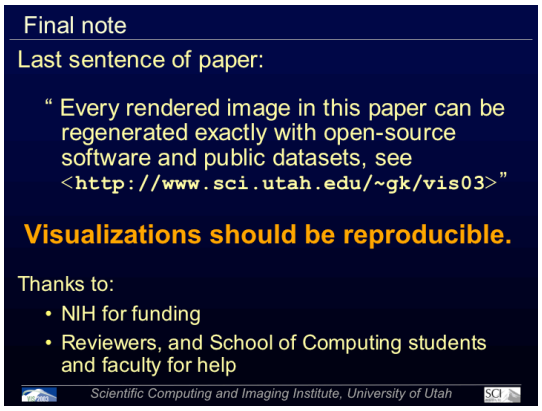
To actually transmit the ideas and results of visualization research, we must "make public" something beyond a static 10 page PDF w/ supplementary materials

Within Visualization: reviewers (correctly) criticize insufficient comparison with previous methods

Doing that well requires access to other's implementations

High or unfair costs on authors

- (before publication) Reimplement all previous methods for meaningful comparison (beyond lit. review)
  - Also pay interest: shifting technology (e.g. GPUs), increasing software + algorithmic complexity



From presentation of: G Kindlmann, R Whitaker, T Tasdizen, T Möller. "Curvature-Based Transfer Functions for Direct Volume Rendering: Methods and Applications" Proc. 14th IEEE Visualization 2003, pp 513–520
Figures still reproducible w/ Teem http://teem.sf.net

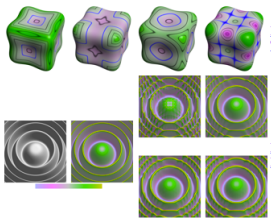


Figure 1: Teaser

Figures 2,3: Marschner-Lobb renderings

- (after publication) Release, maintain, document, support software
- Publish and archive (or even update) reproducibility information

More costs and risks

For authors:

- Not getting acknowledged when software is used (c.f. citation)
- Scooped on own future work

For Research Community:

- Loss of credibility and impact
- Incredible diversity of methods, applications, and platforms: no single solution for everyone

Amongst which players can costs be shared fairly?

- Author
- Author's advisor
- Author's institution and its support staff
  - (Institutions vary widely in this capacity!)
- Research (sub)community
- Reviewers
  - SIGMOD Reproducibility Panel
- VisWeek
- IEEE TVCG

Essential complicating tensions

Self-contained ↔ Status update on long-running systems

Use page budget on technical/implementation detail
↔ on documenting thought process and intellectual path

Basic ideas (longevity) ↔ hardware-dependent (cutting-edge)

Reproduce right now (SIGMOD)
↔ Reproduce now, **and** in 10 years, 20 years, etc.

Reproducibility for whom? Nearest academic peers in same area (with access to same kinds of resources)
↔ non-academic citizen scientists (w/out same resources)

Last-minute hacking prior to deadline (more like biologists)
↔ steady application of good software engineering

Basic methods independent of specific datasets
↔ requiring data as much as code (but **data is capital**)

Will happen at the decade time-scale

NSF and NIH have long encouraged sharing

2011: NSF Data Management Plan

1980 Bayh-Dole → Tech-Transfer Offices

Grasped open source licensing within last decade

Journal of the American Statistical Association (JASA)
(from Victoria Stodden http://www.stanford.edu/~vcs/talks/RRJuly152011-STODDEN.pdf)

articles using computation: 1996 <50% → 2011 100%

articles w/ code available: 1996 0% → 2011 21%

"Visualization + Info Vis" → "Visualization + Info Vis + VAST"
→ "SciVis + InfoVis + VAST + LDAV + BioVis @VisWeek"

World is changing, and moving towards reproducibility.

We are changing. Let's move towards reproducibility.

How VisWeek requests reproducibility

http://visweek.org/visweek/2012/info/call-participation/**paper-submission-guidelines**

Paper Submission Guidelines

All conferences at **IEEE VisWeek 2012** use similar submission and review processes. Please read the individual Call for Papers for each of the conferences here: SciVis, InfoVis, and VAST.

Make sure that you carefully read the guidelines below before submitting your paper.

1. Important dates
2. Submission Criteria and Review Process
3. Supplemental Material and Formatting Guidelines
4. General Expectations and Ethics Guidelines
5. Paper Types

1.- IMPORTANT DATES

Abstract submission (MANDATORY)	Wednesday, March 21, 2012
Paper submission	Saturday, March 31, 2012
Notification of results of first review cycle	Wednesday, June 6, 2012
Paper submission for second review cycle	Wednesday, June 27, 2012
Final notification	Wednesday, July 11, 2012
Camera ready copy	Wednesday, August 1, 201

All deadlines are at 5:00pm Pacific Time (PDT).

2.- SUBMISSION CRITERIA AND REVIEW PROCESS

All conferences at IEEE Visweek will now accommodate a double-blind review process for those authors that want to submit their work anonymously. Therefore, those authors should NOT include their name or institution on the cover page of the initial submission, and should make an effort to ensure that there is no revealing information in the text (such as obvious citations to authors' previous work, or making acknowledgments to colleagues of long standing). Authors should also avoid posting their submitted manuscript on the web until the final notification date. To reiterate, the choice of complete anonymity is optional. Authors can reveal their names and affiliations in the first round of the review cycle if they choose not to anonymize their work.

Note that submission of an abstract for each paper is **mandatory** by **Wednesday, March 21, 2012** and full papers are due **Saturday, March 31, 2012**. Late submissions, or submissions without a previously submitted abstract will not be accepted. All submissions must be original works that have not been published previously in any archived conference proceedings, magazine, or journal. Related previous work by the authors must be cited (anonymously if desired and appropriate), and the differences to work described in the submitted manuscript must be clearly explained. Concurrent submissions are strictly forbidden. If it is determined that an identical or substantially similar manuscript is simultaneously under consideration at another publication venue or forum (e.g., conference, journal, edited book) the manuscript will be rejected

A paper is considered published if it has appeared in a peer-reviewed archived journal or in published meeting proceedings that are commercially available afterward to non-attendees in the form of archives (including digital). However, work described in the Interactive Posters, Contest Entries, or Late-Breaking Hot Topics venues from previous Visweek conferences is not considered formally published, and may be resubmitted provided it has substantial additional new material.

3.- SUPPLEMENTAL MATERIAL AND FORMATTING GUIDELINES

Papers can be up to a maximum of ten (10) pages in length, with the caveat that an optional tenth page can only contain references. Note that we have increased the upper limit for page length only to accommodate those papers whose contribution does not fit the standard 8 page format. When writing your paper keep in mind that overly long papers will add additional burden to the reviewers and that they have been explicitly instructed to make sure paper length is commensurate with its stated contribution. You may be asked to compress your paper in a second round if it is not.

Papers can include full-color figures throughout. We encourage the use of digital video to enhance the submission (which could be embedded directly into the pdf version of the paper), particularly if part or all of the work addresses interaction techniques. Submission of code or other supplemental material in order to increase the reproducibility of the work is also encouraged. Those submitting to the conference are urged to make available salient parameter settings of pertinent algorithms and ideally obtain results using open source data. In case specific data sets are employed, we ask that a version of these be made available where possible. We also encourage the placement of a teaser image on the very first page to showcase your work.

Please take note that this year's review process will be optionally double-blind for those who want to submit their work anonymously (double-blind means that no one, other than the IPC members will know the identity of the authors). When submitting for double-blind reviewing you are asked NOT to include any identifying information. If you do not want to anonymize your submission you are free to leave your name and affiliation on the first page. In that case the review process will be single-blind, i.e. the reviewers know the identity of the authors, but the authors do not know the identity of the reviewers.

Details and guidelines for preparing a proper submission depend on your targeted conference:

- for Vis and InfoVis research papers : http://www.cs.sfu.ca/~vis/Tasks/camera_tvcg.html
- for VAST research papers : http://www.cs.sfu.ca/~vis/Track/visweek.html

4.- GENERAL EXPECTATIONS AND ETHICS GUIDELINES

At least one author of an accepted paper must attend the conference to present the work, and authors will also be required to present a very brief summary of their talk at the opening papers preview session.

We expect that submissions will clearly discuss the novel and significant contributions and place them in the context of prior art in the field. This will involve highlighting how the current contributions differ from and advance the state-of-the-art in visualization, especially, but not limited to previous work published in the IEEE Transactions on Visualization and Computer Graphics (TVCG) and other leading journals and conferences including IEEE InfoVis, IEEE SciVis, IEEE VAST, ACM SIGGRAPH, CHI, UIST, EuroVis, and PacificVis.

When submitting your paper you will be asked to provide a complete list of authors even when submitting an anonymized version of the manuscript. This is required to avoid potential conflicts of interest when assigning reviewers. Adding additional authors AFTER the acceptance of a paper is unacceptable and will not be permitted.

Submissions will be treated as confidential communications during the review process, so submission does not constitute public disclosure of any ideas therein. Submissions should contain no information or materials that will be proprietary or confidential at the time of publication (at the conference), and should cite no publications that are proprietary or confidential at the time of publication.

Our conference will adhere to the VGTC ethics guidelines for reviewers, which can be found at http://vgtc.org/wpmu/techcom/conferences/ethics-guidelines/.

5.- PAPER TYPES

A Visweek paper typically falls into one of five categories: technique, system, design study, evaluation, or model. We briefly discuss these categories below. Although your main paper type has to be specified during the paper submission process, papers can include elements of more than one of these categories. Please see "Process and Pitfalls in Writing Information Visualization Research Papers" by Tamara Munzner for more detailed discussion on how to write a successful Visweek paper.

Technique papers introduce novel techniques or algorithms that have not previously appeared in the literature, or that significantly extend known techniques or algorithms, for example by scaling to datasets of much larger size than before or by generalizing a technique to a larger class of uses. The technique or algorithm description provided in the paper should be complete enough that a competent graduate student in visualization could implement the work, and the authors should create a prototype implementation of the methods. Relevant previous work must be referenced, and the advantage of the new methods over it should be clearly demonstrated. There should be a discussion of the tasks and datasets for which this new method is appropriate, and its limitations. Evaluation through informal or formal user studies, or other methods, will often serve to strengthen the paper, but are not mandatory.

System papers present a blend of algorithms, technical requirements, user requirements, and design that solves a major problem. The system that is described is both novel and important, and has been implemented. The rationale for significant design decisions is provided, and the system is compared to documented, best-of-breed systems already in use. The comparison includes specific discussion of how the described system differs from and is, in some significant respects, superior to those systems. For example, the described system may offer substantial advancements in the performance or usability of visualization systems, or novel capabilities. Every effort should be made to eliminate external factors (such as advances in processor performance, memory sizes or operating system features) that would affect this comparison. For further suggestions, please review "How (and How Not) to Write a Good Systems Paper" by Roy Levin and David Redell, and "Empirical Methods in CS and AI" by Toby Walsh.

Application / Design Study papers explore the choices made when applying visualization and visual analytics techniques in an application area, for example relating the visual encodings and interaction techniques to the requirements of the target task. Similarly, Application papers have been the norm when researchers describe the use of visualization techniques to glean insights from problems in engineering and science. Although a significant amount of application domain background information can be useful to provide a framing context in which to discuss the specifics of the target task, the primary focus of the case study must be the visualization content. The results of the Application / Design Study, including insights generated in the application domain, should be clearly conveyed. Describing new techniques and algorithms developed to solve the target problem will strengthen a design study paper, but the requirements for novelty are less stringent than in a Technique paper. Where necessary, the identification of the underlying parametric space and its efficient search must be aptly described. The work will be judged by the design lessons learned or insights gleaned, on which future contributors can build. We invite submissions on any application area.

Evaluation papers explore the usage of visualization and visual analytics by human users, and typically present an empirical study of visualization techniques or systems. Authors are not necessarily expected to implement the systems used in these studies themselves; the research contribution will be judged on the validity and importance of the experimental results as opposed to the novelty of the systems or techniques under study. The conference committee appreciates the difficulty and importance of designing and performing rigorous experiments, including the definition of appropriate hypotheses, tasks, data sets, selection of subjects, measurement, validation and conclusions. The goal of such efforts should be to move from mere description of experiments, toward prediction and explanation. We do suggest that potential authors who have not had formal training in the design of experiments involving human subjects may wish to partner with a colleague from an area such as psychology or human-computer interaction who has experience with designing rigorous experimental protocols and statistical analysis of the resulting data. Other novel forms of evaluation are also encouraged.

Theory/Model papers present new interpretations of the foundational theory of visualization and visual analytics. Implementations are usually not relevant for papers in this category. Papers should focus on basic advancement in our understanding of how visualization techniques complement and exploit properties of human vision and cognition.

SUPPLEMENTAL MATERIAL AND FORMATTING GUIDELINES

... Submission of code or other supplemental material in order to increase the reproducibility of the work is also encouraged. Those submitting to the conference are urged to make available salient parameter settings of pertinent algorithms and ideally obtain results using open source data. In case specific data sets are employed, we ask that a version of these be made available where possible.

Resources

(who's going to manage a living version of this for Vis?)

http://www.stodden.net/AMP2011/

Reproducible Research: Tools and Strategies for Scientific Computing; A workshop in association with Applied Mathematics Perspectives 2011, University of British Columbia, July 13-16, 2011, e.g. http://www.youtube.com/watch?v=UDOFjGsokxw&feature=relmfu with PDF of slides at http://www.stanford.edu/~vcs/talks/RRJuly152011-STODDEN.pdf

http://www.stanford.edu/~vcs/AAAS2011/

The Digitization of Science: Reproducibility and Interdisciplinary Knowledge Transfer; A symposium at the AAAS Annual Meeting at the Washington Convention Center, Washington, DC, Feb 19, 2011

http://www.eurorvvv.org

EuroRVVV: EuroVis 2012 Workshop on Reproducibility, Verification, and Validation in Visualization (Paul Rosenthal, Britta Weber)

http://www.reproducibleresearch.net/blog/

Reproducible Research web page, links to scientific fraud examples

http://www.executablepapers.com/index.html

The Executable Paper Grand Challenge from Elsevier

http://www-stat.stanford.edu/~donoho/Reports/2008/15YrsReproResch-20080426.pdf

Donoho et al: 15 Years of Reproducible Research in Computational Harmonic Analysis (2008)

http://www-stat.stanford.edu/~wavelab/Wavelab_850/wavelab.pdf

Buckheit and Donoho: WaveLab and Reproducible Research (1998)

My point, again

Sure, let's keep talking about reproducibility, but

Let's find fair ways of sharing its costs, and then

Let's walk our talk!

Acknowledgements: Discussions with you at VisWeek 2012 (Chris Johnson, Chuck Hansen, Carlos Scheidegger, Peer Timo-Bremer, Roni Choudhury, Daniel Acevedo, Guo-Shi Li, Tino Weinkauf), EuroRVVV Workshop at EuroVis'12 (organized by Paul Rosenthal and Britta Weber), "Verification in Visualization" panel at VisWeek 2011 (organized by Robert M. Kirby and Claudio T. Silva)