Are They Really Listening? How to Give Scientific Presentations

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Outline

1. Introduction (10 minutes)
2. Structure: The Strategy You Choose (20 minutes)
3. Sample Presentation: Evolutionary Trees and Tuple Space (20 minutes)
4. Visual Aids: Your Supporting Cast (15 minutes)
5. Delivery: It’s Showtime! (10 minutes)
6. Wrap-Up (15 minutes)
Part I

Introduction
Why Do We Give Presentations?

- **Persuasive**: Convincing your audience to follow a particular course of action.
- **Instructional**: Showing others how to perform a specific task (e.g., laboratory demonstration).
- **Informative**: Presenting new findings or information.
Giving an Effective Presentation is Difficult

- One chance for the audience to hear.
- The audience cannot look up background information.
- The audience is restricted to the speaker’s pace.
- Success of the presentation is dependent upon the speaker’s ability to deliver.
- Training on how to give scientific presentations is often not provided.
Why Do Presentations Fail?

- Neglecting the audience
- Distracting visuals
- Too much information
- Poor introduction
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Introduction
Part II

Structure: The Strategy You Choose
Workshop Activity #1

Draw a map from your university to the airport.
Figure: Map from Texas A & M University to Easterwood airport.
Figure: Boston subway map.
Maps and Presentations

- **Maps**
  - Every map has an intended audience.
  - A map’s intention is not to show everything.
  - Instead, it displays information that is of interest to the intended audience.

- **Presentations**
  - Your presentation also has an intended audience.
  - Find out what they care about and prepare accordingly.
A Presentation Should Tell a Story

- A presentation is not a diary.
  - You will never be able to tell the full story.
  - You must select the pieces that are the most relevant.
- But, how do you select what to present?
Workshop Activity #2

Imagine that you are packing for a trip. What will you bring?
I Need More Information!

- What is my destination?
- What is my purpose (e.g., vacation, business trip)?
- How long will I be gone?
Packing and Presentations

- You wouldn’t pack for a trip without knowing the destination and the intended purpose.
- Similarly, you should never give a presentation without considering your audience and their needs.
Thinking About Your Audience

- What does the audience know?
- What are they unlikely to know?
- What kind of talk would they find appealing?
My Workshop Audience

- Composed mostly of students.
- Have given or seen a scientific presentation.
- Interested in learning about giving effective presentations.
- Expects some interaction during the workshop.
Part III

Sample Presentation
Title: Evolutionary Trees and Tuple Space

Abstract: The computational grand challenge problem of evolutionary biology is to reconstruct the “Tree of Life”, the evolutionary history of all organisms. Estimates of the size of the “Tree of Life” range from the millions to hundreds of million of taxa. However, current methods do not scale to the size and accuracy required for reconstructing the ”Tree of Life”.

In this talk, I will discuss a promising approach that harnesses the power of cooperation to reconstruct large-scale evolutionary trees quickly and accurately. In particular, our approach combines a population-based global search with individual local searches. Finally, I will discuss the parallelization of our approach using Linda, a coordination language based on a shared data space containing tuples.
Workshop Activity #3

After reading the abstract, what questions must this presentation address in order for you to consider it successful?
What Does the Audience Want to Know?

- What’s the Problem? (Introduction)
- What are You Doing? (Experiment and Method)
- What Have You Found and What Does It Means? (Results and Discussion)
- Take-Home Message (Conclusions)
- Who Did and Paid for the Work? (Acknowledgements)
Evolutionary Trees and Tuple Space
(Introduction Only)
Figure: Phylogeny: Illustration.
Dr. David Acer, a Florida dentist

- In 1990, a Florida woman contracted AIDS without exposure to the established risks of HIV.
- The CDC launched an extensive investigation to establish the cause of her HIV contraction.
- They suspected her dentist, Dr. David Acer, who was suffering from AIDS, was responsible for her AIDS contraction.
- Was the dentist responsible for infecting the Florida woman? If so, how could it be proven?
Figure: Phylogeny of HIV transmission in the Florida dentist case.
Dr. Richard Schmidt, a Louisiana physician

- In 1998, a Louisiana woman claimed that her ex-lover and physician, Dr. Richard Schmidt, deliberately injected her with HIV-tainted blood.
- Evolutionary trees proved that the physician did indeed infect his ex-lover with HIV-tainted blood.
- This case marks the first time that evolutionary trees were admitted as evidence in a US criminal court.
- Schmidt is serving a 50-year sentence for attempted second-degree murder.
Evolutionary Trees and Relationships

- Here, relationship refers strictly to connections based on genealogy.
- In other systems, relationship may be equated with similarity without any evolutionary implications.
- Evolutionary trees are hypotheses and not facts. Their "accuracy" depends upon both the quality and quantity of data which support them as well as the methods used to reconstruct them.
Introduction

Tree-Building Timeline

- **1980s:** Most published trees consisted of less than 50 taxa (or organisms).
- **1990s:** Evolutionary trees with 500 taxa could be constructed in a few hours!
  - Previously required years on a cluster!
  - The parsimony ratchet lead to faster and more accurate algorithms.
- **Today:** Phylogenetic trees with 16,000 taxa can be constructed in less than a day!
- **Future:** To reconstruct the Tree of Life!
Introduction
Phylogenetic Methods

- Distance-based methods
  **Software:** PAUP*, BIONJ

- Parsimony-based methods
  **Software:** PAUP*, Phylip, Mega, TNT

- Likelihood methods
  **Software:** PAUP*, Phylip, fastDNAML, GAML, MrBayes

- Meta-methods
  **Software:** TREE-PUZZLE, PAUP*, Rec-I-DCM3
Our focus will be on Maximum Parsimony

- **Small Parsimony Problem (Tree Evaluation):** Compute MP score for a given tree $T$.
  - $O(nk)$, where $n$ is the number of sequences and $k$ is the sequence length.

- **Large Parsimony Problem (Tree Search):** Find the trees with minimal cost by searching the tree space.
  - Very difficult! It’s an NP-hard problem.
  - For $n$ taxa, there are $(2n-5)(2n-3)\cdots(5)(3)$ trees.
  - Over 13 billion possible trees for 13 taxa!
Maximum Parsimony

Sample Presentation: Evolutionary Trees and Tuple Space

Figure: Evaluation of a fixed tree.
Figure: Exhaustive search under MP.
Maximum Parsimony Algorithms

- **Sequential**
  - Parsimony Ratchet
  - TNT
  - Rec-I-DCM3 (the best performer to-date)

- **Parallel**
  - Phylospaces
**Figure:** Phylospaces: Evolutionary trees cooperating in tuple space.

```
out("tree", 3, "((D,A),B,C))")

in("tree", ?tid, ?str, ?score)

eval("recidcm3", recidcm3(id))

("tree",10,"((A,B),(C,D)), 43)

("tree",0,"((A,C),(B,D)), 39")

("bestSore", 35)

("tree",10,"((A,B),(C,D)), 43")

Tuple Space

merger(id=4)

recidcm3(id=1)

startup(id=0)

recidcm3(pid=2)

recidcm3(pid=3)
```

```
rd("tree", ?tid, ?str, 40)
```
Remainder of Evolutionary Trees Presentation

- Discussion of the Phylospaces algorithm
- Performance results
- Concluding remarks
Figure: Timeline showing presenter reaching multiple audiences. Adapted from *The Craft of Scientific Presentations* by Michael Alley.
Part IV

Visual Aids: Your Supporting Cast
Presentation Software

- **PowerPoint**
  - The most frequently used software for creating presentations.
  - “Power corrupts. PowerPoint absolutely corrupts.” – Edward Tufte

- **Keynote** (only available on Mac OS X)

- **LaTeX-based tools**
  - Prosper
  - Beamer (used for this workshop presentation)
Review of Test Data Indicates Conservatism for Tile Penetration

- The existing SOFI on tile test data used to create Crater was reviewed along with STS-87 Southwest Research data
  - Crater overpredicted penetration of tile coating significantly
    - Initial penetration to described by normal velocity
      - Varies with volume/mass of projectile (e.g., 200ft/sec for 3cu. In)
    - Significant energy is required for the softer SOFI particle to penetrate the relatively hard tile coating
      - Test results do not show that it is possible at sufficient mass and velocity
    - Conversely, once tile is penetrated SOFI can cause significant damage
      - Minor variations in total energy (above penetration level) can cause significant tile damage
  - Flight condition is significantly outside of test database
    - Volume of ramp is 1920 cu in vs 3 cu in for test
Mathematical Overkill

Reactive processes

R1 \[ P = P \land (tr \leq tr') \]
R2 \[ P(tr, tr') = P('<\rangle, tr' - tr) \]
R3 \[ P = \llbracket\{tr, ref, wait\}\rrbracket \bowtie \text{wait} \triangleright P \]
where \[ \llbracket = \text{df} \neg ok \land (tr \leq tr') \lor \]
\[ ok' \land (tr' = tr) \land \cdots \land \]
\[ (\text{wait}' = \text{wait}) \]

CSP

R1 – R3
CSP1 \[ P = \neg ok \land (tr \leq tr') \lor P \]
CSP2 \[ P = P; ((ok \Rightarrow ok') \land (tr' = tr) \land \cdots \land (ref' = ref)) \]
CSP3 \[ P = \text{SKIP}; P \]
CSP4 \[ P = P; \text{SKIP} \]
CSP5 \[ P = P ||| \text{SKIP} \]
Keep It Short and Simple (K.I.S.S.)

- Some people cannot resist the temptation to assert their mathematical superiority.
- Consider the following equation

\[ \ln(e) + \sin^2 x + \cos^2 x = \sum_{n=0}^{\inf} 2^{-n} \]

and its more “trivial” form

\[ 1 + 1 = 2. \]
while (1) {
    in ("treeCnt", &treeCnt);
    if (treeCnt > 0) {
        out ("treeCnt", treeCnt - 1);

        /* create initial tree */
        initString(s);
        sprintf(s, "%s -n -u %s > %s", PAUP_PATH, paupFile, junkFile);
        system(s);

        infp = fopen(greedyMPFile, "r");
        fscanf(infp, "%s", greedyMPString);
        fclose(infp);
        fprintf(treefp, "tree = %s\n", greedyMPString);

        /* compute MP score of newly created tree */
        computeMPScore (&mpScore, greedyMPFile, SEQFILE);
        printMessage(LOGFP[id], WNAME[id], VERBOSE, "greedy MP tree created");
        printf(treefp, "MP score: %g\n", mpScore);
        fflush(treefp);

        /* apply tbr on newly created tree */
        sprintf(cmd, "perl %s/perl_scripts/do_tnt_tbr_start.pl %s %s %s %s %d", DCM3_PATH, SEQFILE, greedyMPFile, tbrTreeFile, tbrTreeScoreFile, tag);
        system(cmd);
Code Fragments II

```c
printMessage(LOGFP[id], WNAME[id], VERYVERBOSE, "TBR applied to greedy MP tree");

/* get contents of tbrTreeFile */
fp = fopen(tbrTreeFile, "r");
fscanf(fp, "%s", startTree);
fclose(fp);

/* get tbrTree score */
fp = fopen(tbrTreeScoreFile, "r");
fscanf(fp, "%g", &mpScore);
fclose(fp);
printMessage(LOGFP[id], WNAME[id], VERYVERBOSE, "tbr tree score: %g", mpScore);

/* place tree into tuple space */
in ("tree id", ?treeId);
out ("tree id", treeId + 1);
out ("tree", WNAME[id]:, treeId, 0, startTree:, mpScore);
printMessage(LOGFP[id], WNAME[id], VERBOSE, "starting tree %d placed into tuple space", treeId);
}
else { /* no more trees to create */
out ("treeCnt", treeCnt);
assert(treeCnt == 0);
removeFile(greedyMPFile);
removeFile(junkFile);
removeFile(paupFile);
removeFile(tbrTreeFile);
```
Code Fragments III

```c
removeFile(tbrTreeScoreFile);
printMessage(LOGFP[id], WNAME[id], 1, "greedyMP done!");
return 0;
```

**Table:** A poorly designed table.

<table>
<thead>
<tr>
<th>STATISTICS</th>
<th>SMALL</th>
<th>LARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characters</td>
<td>18,621</td>
<td>1,231,109</td>
</tr>
<tr>
<td>Words</td>
<td>2,060</td>
<td>173,145</td>
</tr>
<tr>
<td>After stopping</td>
<td>1,200</td>
<td>98,234</td>
</tr>
<tr>
<td>Index size</td>
<td>1.31 Kb</td>
<td>109.0 Kb</td>
</tr>
</tbody>
</table>
### Visual Aids: Your Supporting Cast

**Tables**

<table>
<thead>
<tr>
<th>Collection</th>
<th>Small</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>File size (Kb)</td>
<td>18.2</td>
<td>1,202.3</td>
</tr>
<tr>
<td>Index size (Kb)</td>
<td>1.3</td>
<td>109.0</td>
</tr>
<tr>
<td>Number of words</td>
<td>2,060</td>
<td>173,145</td>
</tr>
<tr>
<td>After stopping</td>
<td>1,200</td>
<td>98,234</td>
</tr>
</tbody>
</table>

**Table:** A well-designed table.
Figure: A first attempt at designing a plot.
Figure: A better-designed plot.
Rec-I-DCM3 Worker Processes

Phase 0: Initial tree seeding process

do i=1,n: out("tree", i, newickStr)

"tree", 1, newickStr
"tree", 2, newickStr
"tree", 3, newickStr
... 
"tree", n, newickStr

Tuple Space (before current iteration)

(worker 1 - worker n)

"tree", i, str

(worker 1 - worker n)

"tree", i, str'

Tuple Space (after current iteration)

for all trees in AUBUC, do i=1,n: out("tree", i, newickStr)

Tuple Space (after current iteration)

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Rec-I-DCM3 Worker Processes

Phase 0: Initial tree seeding process

do i=1,n: out("tree", i, newickStr)

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Tuple Space (before current iteration)

(worker 1 - worker n)

"tree", i, str

(worker 1 - worker n)

"tree", i, str'

Tuple Space (after current iteration)

for all trees in AUBUC, do i=1,n: out("tree", i, newickStr)

Merger Process:
Selection / Recombination
1. Divide tree population into sets A, B, and C.
2. Contents of A, B, and C depend on strategy, and may involve creation of new trees derived from recombination of selected trees in TS population.
3. Repopulate TS with A U B U C

Figure: A figure with too much detail.
Figure: An improved figure.
Part V

Delivery: It’s Showtime!
Speech

- Show enthusiasm.
- Speak freely.
- Speak clearly.
- Speak slower than you would in a normal conversation.
- Make sure you are speaking the audience’s language.
Don’t go over your allotted time!
Handling Questions

**You say:** That’s a very interesting question.
**You mean:** You obviously didn’t listen properly.

**You say:** I’m glad you raised that point.
**You mean:** I’ll say it again, so listen this time!

**You say:** I’m afraid I don’t know the answer to that one.
**You mean:** Why did you have to ask that? It’s irrelevant here.

**You say:** Yes, the additional experiments you suggest are very appropriate.
**You mean:** I don’t care about running more experiments. I simply want to graduate!
Don’t forget ...

- You are the expert!
- A few people ask questions to be obnoxious.
- Many people ask questions because they are interested in your work.
- The sign of a good presentation is a lively discussion afterwards.
Part VI

Wrap-Up
Dressing Up Your Presentation

- Fonts
- Colors
- Animation
- ... much more
Summary

- The key to an effective presentation is concern for your audience.
- Don’t overwhelm them, but don’t underwhelm them either.
- Say what you need to say and sit down. Everyone’s internal clock is ticking.
- Relax, stay calm, and remember you are the expert!
References

How to Obtain Workshop slides

- Only available for a limited time at the reduced price of $19.99. Ask for the Tapia special!
- Or, you can visit http://faculty.cs.tamu.edu/tlw.
THANKS FOR LISTENING!