Quality Research in Affordable Ways

J’s Legacy
THE FOLLOWING **CONTENT** HAS BEEN APPROVED FOR
**RESTRICTED AUDIENCES ONLY**
BY THE MOTION PICTURE ASSOCIATION OF AMERICAN, INC.

THE CONTENT ADVERTISED HAS BEEN RATED

<table>
<thead>
<tr>
<th>R</th>
<th>RESTRICTED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UNDER 17 REQUIRES ACCOMPANYING PARENT OR ADULT GUARDIAN</td>
</tr>
<tr>
<td></td>
<td>STRONG LANGUAGE, MILD VIOLENCE</td>
</tr>
</tbody>
</table>

www.filmratings.com   www.mpaa.org
DISCLAIMER

The author does not provide any warranty of the views whatsoever, whether express, implied, or statutory, including, but not limited to, any warranty that the views will be error-free.

In no respect shall the author incur any liability for any damages, including, but limited to, direct, indirect, special, or consequential damages arising out of, resulting from, or any way connected to the use of the views, whether or not based upon warranty, contract, tort, or otherwise; whether or not injury was sustained by persons or property or otherwise; and whether or not loss was sustained from, or arose out of, the results of, the item, or any services that may be provided by the author.

The views expressed here are solely those of the author and not those of the corporation, its employees, trustees, or assigns.

The author does not claim any ownership (physical, legal or copyright) to any of the images used.
Ep1: Seeking skills
What can I do?
Quality Research

• Quality research creates values.
  – Academic value [our focus]
    • Accepted by top-ranked conference/journal
  – Social value
    • Get media attention
  – Business value
    • found a startup company

• Quality research thinks about the real problem not just the research problem.
Conference Ranking Systems

1\(^{st}\) tier
- Complete, readable, practical value, wide influence/pushed to the limit

2\(^{nd}\) tier
- Complete, readable, practical value/following 1\(^{st}\) tier’s topic

3\(^{rd}\) tier
- Complete, readable

Unranked
- Complete, readable, various style
Avoid instant kills

• Questionable value of your topic
  – “more generally, I get the feeling that [what we did] is a losing battle ...”
  – Rejected by CCS ‘10: 3 WAs and 1 WR

• Over-claimed sentence
  – “Some assertions are stronger and more general (applying to all systems) than supported by evidence presented ...”
  – Rejected by CCS ‘11: 1 WA, 1 BD, and 2 WR

• Other questionable things you cannot deny unless properly addressed by prior literature
Easy Types

• If your major contributions are related to unquestionable facts.
  – Attack
    • Say something is bad
  – Analysis
    • Dig out the ugly truth

• Life becomes harder, if you
  – Propose something
    • Say something is good
  – Involved in an arms race
    • Can never claim you are the best
  – Develop pure theory/technology
    • Don’t know how it can be used
Your Choices

• **Theory** or **Application**?
  – Theory: many citations, less engineering work
  – Application: predicable progress, less argument

• **Classic** or **fashion**?
  – Classic: less competitors, deep insight
  – Fashion: tight schedule, sufficient if touching the point (e.g. sufficient impact)

• Different people have different talents and favors.

Quality Research in Affordable Ways
What do you want to do? What can you do?

LOOK INSIDE. FIND YOUR MISSION.
Judgment decided by mission

As a human, no judgment is objective.

No absolutely right or wrong.

You mission tells the rules of making judgments.

If the thing is consistent with your mission, you feel right; otherwise wrong.

A wise mission helps you make a wise judgment.

Be aware of the role of your mission from the beginning.
The way we were told

Fortune

Fame

If you are expecting these, you probably choose the wrong way. Try to find a more honorable mission.
The right attitude

Pretend to be a master

You will become the person you want to be.

You will only accomplish the mission you want to take.

Pretending to be a master increases your confidence, helps you think independently.

Its official name is **autosuggestion**.

You will feel right for the thing you are doing.

You will feel responsible for doing the thing better.

*The feeling is important.*
It is not a shame to make mistakes.

It is a shame if you cannot recover or learn from a mistake.
Find something you are **proud** of, something you will **never doubt**.

Everyone is unique and gifted.

Inner peace gives you power.
Back to the earth

- Start from literature reading
  - Learn the **terminology**
    - white-box cryptography, steganalysis, retrospective interference, ...
  - Learn the **assumptions**
    - Research problem is usually simplified based on certain assumptions.
  - Learn the **presentation skills**
    - How to properly define, argue, organize the contents?
  - Learn the **trends**
    - What do people care most?
Literature reading does not directly tell a good research idea.

• If you are reading a paper accepted by a top-tier conference, and you find:
  – Limitations
    • Most limitations are inherent limitations.
      – It cannot be resolved if the problem settings are not significantly changed.
  – Future work
    • The hardcore work that the authors doesn’t want to touch.
      – It can be accomplished if you have more resources.
    • The dirty work
      – It is a just implementation issue, not so valuable.
But attending a conference gives good insights

- If you are attending a paper presentation at a top-tier conference, and you find:
  - Questions
    - Unaddressed or unclarified issues pinpointed by experts
  - Comments
    - Significance and value of a paper
      - Usually only interesting papers got comments
      - Tell whether you should follow this research direction
  - Discussions
    - Potential future work valued by experts
      - They will acknowledge your contribution if you can answer their questions raised during a discussion
  - Mental association and analogy
    - Similar but not the same idea for a good research topic
      - If this paper can be accepted, my work on similar topic or technical depth should also have a chance to be accepted.
Confirm your idea

Think beyond the research problem

The simplified research problem (e.g. related to a specific forest)

Remove all academic assumptions

Stop. The problem is fictional.

Go on. The problem is real.
Refine your idea
Discover the implications

3rd tier paper

Your research is about a leaf.

2nd tier paper

Your research about a leaf impacts a forest.

1st tier paper

Your research about a leaf impacts the whole planet.

Your research may be the same, but the outcome can be totally different.
Understand the reviews

• Common meanings of scores
  – Strong accept (SA)
    • I like it very much. The reviewer must be a real expert.
  – Accept (A)
    • The highest score given by a non-expert reviewer.
  – Weak Accept (WA)
    • The work is good enough. The highest score given by a hostile reviewer.
  – Borderline (BD)
    • The work can somehow be improved.
  – Weak Reject (WR)
    • The work has major drawbacks.
  – Reject (R)
    • The work goes in the wrong direction. It is totally meaningless.
  – Strong Reject (SR)
    • I feel threatened by letting the work published.
Pinpoint the positive feedbacks

• You are on the right track. 😊
  – “An improved version of this paper will advance the field, and I encourage the authors to continue this line of research. We need more such papers …”
  – “I am borderline for this paper: while the proposed concept is interesting and [what we try to solve] are an interesting problems, …”

• You may be on the wrong track. 😞
  – “more generally, I get the feeling that [what we did] is a losing battle …”
Make the judgment early

Tic-Tac-Toe Game

Your turn now.
A good question to think about.

Doctor of **Philosophy** (Ph.D.)
or Doctor of **Engineering** (D.Eng.)?
The skills shown here are essentially strategic thinking. Strategic thinking may corrupt your integrity. Please use it defensively.

WARNING
Final words

FOLLOW YOUR HEART
Ep2: Working skills
How can I do it?
Work efficiently and sustainably

• Smart working or hard working?
  – **Smart** working
    • Find an easy way to accomplish something.
  – **Hard** working
    • Keep working until the mission completed.

• We need both.
  – Make sure when you work, your work produces results.
  – *Time and youth are most valuable resources.*
A plan makes you work

Most people feel reluctant to work.

**Deadline-oriented planning** sets an objective that motivates you more effectively.

A **reasonable** plan shows the feasibility of catching the deadline.

A plan keeps you working and helps you track the progress.

*Try to make progress everyday.*
Paper-driven scheduling

• The space of a paper is limited.
  – Top tier conference: 8000~9000 word limit
  – Other: even less space

• Raise the priority of the tasks that may contribute to the paper content.
  – Resolve the uncertainty in key selling points first.
  – Do necessary implementation only.
  – Save more time for paper writing.
  – If time is so limited, write the paper as earlier as possible, and do the other things simultaneously.
A good plan is not fixed

- Your implementation may have defects.
- Your objective may not be achievable.
- Your methodology may be wrong.
- You may not have sufficient time.
Feel tired? Bored?

Research Work

Thinking required for each move.
Your brain consumes more energy.

Casual Activity

Just Clicking.
Your body consumes more energy.
Feel sick? Dying?

Be aware of Karoshi (i.e. death from overwork)
A small cup makes you healthier

A small cup contains little water.

You feel thirsty more frequently.

You have to stand up and walk to refill the water.

Your sitting time decreases.

The radiation exposure time also decreases.
Work Under the Interference (WUI)

**WUI** conditions include all the previously mentioned negative conditions, and also emotional interference. **WUI** reduces the efficiency and increase the error rate. **WUI** may completely deplete your thinking ability.

You usually save time for getting rid of **WUI** status before working.
Deadly Stress

Stress (Internal, Feel) ≠ Pressure (External, Fact)

**Physical Disorder**
- Headache
- Stomach upset
- Muscle tension or pain

**Mental Disorder**
- Anxiety
- Restlessness
- Drug, alcohol, or tobacco abuse
- Lack of motivation or focus
- Depression
- Over-eating or under-eating
- Social withdrawal
- Anger / Crazy

**Sub-health**
- Cancer
- Chronic diseases
- Chest pain
- Sleep problems
- Fatigue
- Beauty problems

*Source: American Psychological Association's "Stress in America" report, 2010*
How to Stress Less

Always
- Planning
- Time
- Break
- Small chunks
- Clarify goals
- Priorities
- Thinking
- Positive
- Practice
- Deep breathing
- Good management
- Getting organized
- Healthy eating
- Time management
- Delegating

Avoid
- Pessimism
- Perfectionism
- Procrastination
- Smoking
- Multitasking
- Stressful people
- Little things
- Exercising
- Walking in nature
- Simplifying life
- Time

Spend
- Take commitments
- Over committing
- Over working
- Stressing over little things

“Adopting the right attitude can convert a negative stress into a positive one.” ~ Hans Selye
Mind clearing technology

Play **Fruit Ninja**
(NOT other game)

Wander in **the Circle**
(available 24/7)
Time Segmentation

Morning | Lunch | Afternoon | Dinner | Evening | Night | Late-night snack | Late night

Doing the **right thing** at the **right time** will save your time.

Legend:

- **Best for thinking**
- **Just rest**
- **Any tasks**
- **Only brainless tasks**
Less is More

You can focus your attention only for a short time (less than 1 hour).

If you are doing something complex, you will need a long time segment.

To avoid from feeling tired or bored, divide the tasks into several steps, where each step takes only a short time segment.

Use **planned resting**.

\[0.8\text{hr} + 0.8\text{hr} > 2\text{hrs}\]

Attention span of students for a 40-mins class
Coffee and Tea

Coffee and tea keep you **awake**, but don’t keep you **thinking**. Try to take a **nap** next time.
You are not alone

Isolation does no good.
Collaboration makes us strong.

Most of our major competitors are working in team.

How are you going to compete with them?

Let’s team up!

Voiceover:
Isolation caused Kryptonians to lose their opportunity to leave Krypton, and eventually led to race extinction of Superman.
Good Teamwork: $1 + 1 > 2$

- Key features of a good teammate:
  - **Trustworthy**
    - Be aware that your teammate may steal your idea.
  - **Responsible**
    - Have a sense of time.
    - Continue the task when you feel tired, bored, disgusting, sick, ...
  - **Prudential**
    - Validate the outcome before sharing.
  - **Independent**
    - Work separately without detailed instructions.
    - Inspire you with new information or thoughts.
  - **Complementary**
    - Do the thing you cannot do.
Meeting Time

• The purpose of a meeting:
  – Brainstorm for **hard** problems.
  – Share the **new** progress within a **big** team.
  – Introduce **new** team members.
  – Report the **new** progress to supervisors.

• Reduce **unnecessary** meetings
  – Too many meetings waste time and disturb the tasks requiring long time segments.

• Make an **agenda** before every meeting.
KEY ADVICES

Take care of yourself.
Everything else can wait.
It is worth the effort to find good teammates.
There is no big difference between individuals, but there is between teams.
Final words

TIME IS NOT IMPORTANT; EFFICIENCY IS.
Ep3: Presentation skills
How should I present it?
Effective Expression

• Express **what you want** to express to the **right audience** in a language they **understand**.
  – Be concise
  – Avoid misunderstanding
  – Defend yourself

• **Non-interaction presentation**
  – Paper writing

• **Interactive presentation**
  – Oral talk
Your Role

Jean-Luc said “you are the host and the audience are the guests”.

In fact, your guests are not willing to come even if you sincerely invite them, as you are their competitor.

You have to be more aggressive.

You are now a missionary who are going to convert “heretics”.

In the area of information security, you are a missionary who sends the black mail (i.e. your paper) to “terrify” the reviewers.
Reviewer Characteristics

• For a top-tier conference, you will get comments from 4~5 reviewers.
  – Your paper was disqualified in the early stage of multi-stage review if it only got 2 or less reviews.
  – Your paper usually focuses on a very specific topic.
    • At most 1 reviewer may claim to be an expert.
    • The other reviewers will be in medium or low confidence.
  – Most reviewers are usually not familiar with what you are doing.

• One reviewer, one vote.
Clarify your scope

• Difficult than you might think.
  – Overstated
    • “Some assertions are stronger and more general (applying to all systems) than supported by evidence presented ...”
    • Even disagreeing in minor point may result in instant kill.
  – Understated
    • “The key insights in the paper aren't very deep.”
    • Demean your contribution.
  – Not stated
    • “There is a mismatch between the security claims, the threat model, and the proposed approach ... The type of [an attack technology] is not specified.”
    • Unstated facts may also result in instant kill.
Show the difference

• Avoid the term ‘NOVEL’
  – Most things are conceptually similar to some other things that appeared before.

• Show the key facts:
  – Why is the problem important?
  – Does your solution solve the problem?
  – How better your solution is comparing with prior work?
  – What is the key finding not discovered by prior work?
  – What is the implication of your key finding?
Deal with limitations

Enjoy 30% Discount by visiting our store before 2013. T&C apply.

Terms and conditions: The discount rate is valid only for purchase amount over $1000.

Spend $1000 or more to enjoy 30% discount in our store before 2013.

Make sure that the first limitation appears after all your major benefits.
Result-driven paper layout

• Organize the paper to express your **key findings** to its maximum extent.
  – Follow a template **only when** you have no idea how to organize your contents.
  – Always re-evaluate the **necessity** and **relevance** of a content.
    • Fit into 8000~9000 or even smaller word limit.
  – Present **attractive** key findings as soon as possible.
    • The reviewer loses patience after a long reading.
Common Sections

Recommended writing order:

1. Abstract
2. Introduction
3. Threat Model
4. Technical Details
5. Related Work
6. Conclusion
7. Related Work
8. Conclusion

- **Abstract**
  - Summarize the key findings and decide the tone of the paper.

- **Introduction**
  - Introduce the problem, show the difference, and emphasize the implication of your key findings.

- **Threat Model**
  - Clarify your scope.

- **Technical Details**
  - Provide necessary support for your findings. All the key contents need to be justified.

- **Related Work**
  - Re-emphasize the difference, and discuss the limitations.

- **Conclusion**
  - Re-state the key findings concisely, and give the vision if space is available.

Related Work can be moved to the position between Introduction and Threat Model. Related Work and Threat Model are optional in a short paper. Limitations can be a separate section before Related Work.
Content completeness

Is the problem **solvable**?

- **No.**
  - Proof of **infeasibility**

- **Yes, it is possible but very hard.**
  - Tools for **detecting** the problem

- **Yes.**
  - Tools for **solving** the problem

Evaluation of **effectiveness**

*If any content in this figure is missing, the paper will be considered **incomplete** for a *top tier* conference.*
Formula/Symbol?

Do you want to become an IEEE author?

1 + 1 = 2

Avoid using abstract symbols unless they are more concise than human language.

\[
\ln(e) + \left(\sin^2 \theta + \cos^2 \theta\right) = \sum_{n=0}^{\infty} \frac{1}{2^n}
\]

\[
\ln \left[ \lim_{z \to 0} \left(1 + \frac{1}{z}\right)^z \right] + \left(\sin^2 \theta + \cos^2 \theta\right) = \sum_{n=0}^{\infty} \frac{\cosh y \sqrt{1 - \tanh^2 y}}{2^n}
\]

More complex formula …
Pseudo-objective

Our solution is able to speed up the computation by 500% and reduce the CPU and memory usage by 20%. But it is completely incompatible with the existing systems, which may requires 6 months or more to implement and deploy our solution. Other extra costs may be involved.

Our solution is able to speed up the computation by 500% and reduce the CPU and memory usage by 20%.

... ...

Although our solution requires modifying the existing systems to be integrated, it is just a one-time cost especially after considering its great advantages.

Only tell the partial truth that benefit you.
Be aware that the partial truth could be a lie.
Visibility Control

This is not important. This is not important. This is not important. This is not important. This is not important. This is not important. This is not important.

This is not important. This is not important. This is not important. This is not important. This is not important.

This is important.

Place important sentences in more visible positions.

1. The first sentence of a paragraph
2. The last sentence of the last paragraph of a section
3. Other distinguished positions such as figure/table captions, headings
Connect Sentences

Yesterday was **Monday**.

It was a holiday.

I went to my **grandma**’s house.

My grandma was sick. My uncle was taking care of her.

I had lunch with my **uncle**.

My teacher is my grandma’s friend. I told her about that.

My **teacher** also came.

You may need more sentences to connect the key points that you want to express. Otherwise the readers will feel confused.
Pre-review

• Pre-review helps to find out the problems that you cannot find by yourself.
  – You are too familiar with the contents.
  – You focus too much on the details.
  – Lookers-on see most of the game.
  – It is easy to criticize others.

• You need three types of reviewers:
  – Who is familiar with your work
  – Who knows nothing about your work
  – Who has good language skills
Polish is a **deceptive** term, which seems to indicate that it is possible to convert stone into gold.

*Only the real gold can be polished to exhibit its supreme value. Always focus your **contents** first.*
Technical Depth

**FORMULA** + **IMPLEMENTATION** + **DATA**

- Generalize the scope and applicability
- Show the feasibility and labor
- Support the findings and implications

Good **argument** and **reasoning** are important but do **NOT** contribute to technical depth in the field of computer science.
The **ultimate writing** skill:

*Think like a good *storyteller*.*

*Anticipate the expectation/reaction of your readers.*

**READ LIKE A READER**
You need a **reason** to be rejected

An **accepted** paper may not be an **interesting** paper but must be a **hard-to-reject** paper.
Audience Psychology

• Conference talk has a time limit.
  – 20 minutes or fewer

• Audience have various background knowledge.
  – Most audience are not familiar with what you are doing.
    • They are not expecting to know all the technical details.
    • They want to learn something they don’t know before, and feel better if you can give some unusual insights.
    • They feel bored if they know everything you talk.

• Golden ratio
  – 90% understandable + 10% mystery
  – Your problem and key findings must be clarified.
### Differences between talking and writing

<table>
<thead>
<tr>
<th>Talk</th>
<th>Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel</td>
<td>Sequential</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Talk</th>
<th>Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animated</td>
<td>Static</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Talk</th>
<th>Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are three steps in our solution: 1) … 2) … 3) …</td>
<td>We investigate A. B, C, and D are out of our scope.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Talk</th>
<th>Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concise &amp; Understandable</td>
<td>Precise &amp; Comprehensive</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Talk</th>
<th>Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implication suggested</td>
<td>Implication only for non-key contents.</td>
</tr>
</tbody>
</table>

1 + 3 = 4

\[ k + (k + 2) = 2k + 2, \text{ for } k \in \mathbb{R} \]
Implication
Telling without speaking

We will focus on this problem.
   We will not discuss all the other problems.

This assumption is widely used in prior literature.
   We are not going to justify this assumption.

Their solution needs almost $30k to deploy.
   Our solution is much cheaper.

We will leave it for future work.
   We have some trouble to deal with it.

The proper use of implication saves many words, and
makes your presentation more objective and polite.
Be aware that every word you said has an implication.
Be considerate

• Abc 40pt
• Abc 36pt
• Abc 32pt  - preferred
• Abc 28pt
• Abc 24pt
• Abc 20pt
• Abc 18pt  - minimal font size
• Abc 16pt  - too small
• Abc 14pt
• Abc 12pt

• Black
• Dark red
• Dark blue
• Dark green
• Golden
• Purple  - low contrast below
• Green
• Light blue
• Orange
• Yellow
Difference between working and presenting

When you work

When you present

Scope of problem

Implication of result

Make it specific

Make it general
Acceptance is not guaranteed.

NOTICE
Final words

RESPECT YOUR AUDIENCE; SPEAK HUMAN LANGUAGE.