A Research Mindset

Tracy Camp (Colorado School of Mines)

Kathryn S McKinley (Google)

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Tracy Camp

Known for

Credible wireless
network simulations

My job: Leading CS@Mines

Kathryn McKinley

Known for

My job

Efficiency

My Mindset / Strategies

Optimism

- Always (almost)

Mindset with rejections

- Initially, curse the reviewers
- Later, reread reviews with an open mind

Stress strategies

- Daily exercise (hiking!), family time, hobbies

Research strategies

- Paper reading, weekly P4s

MY CV DOES *NOT* INCLUDE FAILURES

Known for

the *DaCapo* benchmark suite

My job

Efficiency

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My Mindset / Strategies

For bias
- Look ahead of the bandwagon
- Classic problems never go out of style, they just have new contexts

For research setbacks
- Don't wait for external feedback, self identify problems
- Limit feeling sad to X days, then consciously channel sad to response
- Synthesize feedback to adjust strategy
- Strategize with collaborators, ask advice more broadly

For managing my emotions
- Daily exercise, sleep, fruits & vegies, family time

For creativity
- Create unscheduled work time (sadly still often on weekends)
- Read a lot and critically; what did they forget? logical next 4 steps/papers?

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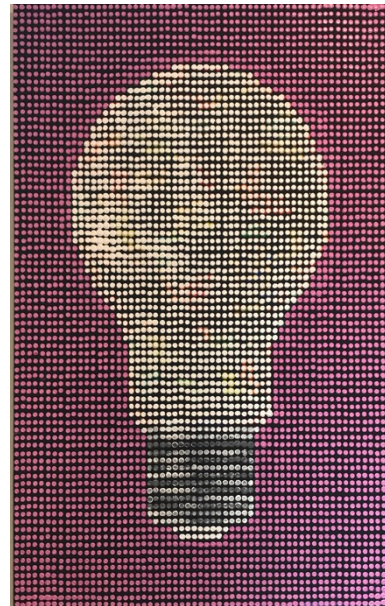Widening Participation

A Research Mindset

I will

1. Examine and counter my biases

2. Learn from failures

3. Learn emotional resilience

4. Learn & innovate technically

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What's Next?

Concepts

- Cognitive bias and creativity
- Flexible optimism for perseverance
- Growth Mindset

Bias

- A **cognitive bias** is a pattern judgment, which humans need to function and *at the same time* leads to illogical conclusions

- Bias arises from various processes and are difficult to distinguish

- use of information-processing shortcuts (heuristics, generalizations)

- mental noise

- the mind's limited information processing capacity

- emotional and moral motivations

- social influence

Example Biases

- Stereotypes
- Survivor
- Anchoring
- Confirmation
- Exposure & Recency
- Attention (repetition)
- Conservative (Bayesian)
- Gamblers' fallacy

- Authority
- Bandwagon
- Dunning-Kruger effect newbies overestimate, experts underestimate
- Framing
- Von Restorff effect remember surprises
- Curse of Knowledge
- Congruence (one hypothesis)

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Example Biases

- Stereotypes
- Survivor
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- Authori...

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CREATIVE THINKING "OUTSIDE THE BIAS BOX"

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Example Biases

- Stereotypes
- Survivor
- Ana...

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CREATIVE THINKING "OUTSIDE THE BIAS BOX"

Slow Down

Examine your Biases

of Knowledge

- Congruence (one hypothesis)

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Life Happens

Real Life is Unpredictable

- World events

- Local events

- Family & Friends   good / bad

- Relationships

- Health

Research Events Are Predictable

- Have ideas
- Work on ideas
- Discuss ideas informally
- Write up ideas
- Submit paper
- Give talk / teach class
- Receive feedback
- Receive structured feedback

good / bad
succeed / fail
well / poorly
well / poorly
accept / reject
well / poorly
positive / negative
positive / negative

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How you interpret
good & bad life events
is under your control

Keeping Positive

I will

- learn and execute strategies to overcome failures and obstacles

- learn and execute emotional resiliency strategies to manage myself in times of stress and failures

Pessimism versus Optimism

- What is optimism?
- What is pessimism?

- Can optimism be learned?

- Is optimism a biased view of reality?
- Is optimism always the better choice than pessimism?

Optimism Benefits

- Improved Health

- Higher motivation and performance

- Elevated career success

Explanatory Style (The 3 P's)

1. Permanence (time)

2. Pervasiveness (space)

3. Personalization (you or not you)

Permanence (time)

- **Optimistic**
  - Good events have permanent causes
  - Bad events have temporary causes / specific to situation

- **Pessimistic**
  - Good events have temporary causes
  - Bad events have permanent causes / specific to situation

Pervasiveness (space)

- **Optimistic**
  - Good events caused by general / universal factors
  - Bad events caused by specific factors

- **Pessimistic**
  - Good events caused by specific factors
  - Bad events caused by general / universal factors

Personalization

- **Optimistic**
  - Good events caused by me & other factors
  - Bad events caused by circumstances, luck, others

- **Pessimistic**
  - Good events by circumstances, luck, others
  - Bad events caused by me

Pessimists

Believe bad events / misfortune

1. will last a long time
2. will undermine everything they do
3. are their own fault

Pessimistic explanatory style produces <u>passiveness</u> … as they believe action is futile

Optimists

Believe bad events / misfortune

1. is a temporary set back

2. is limited to this one event

3. is not their fault

Optimistic explanatory style produces <u>action</u> … optimists will even try *harder* after a defeat

Delusions

- It is never your fault

- Optimism is desired in all situations

- Optimistic people face less failures

- Optimism is a character trait and cannot be learned

- Success favors the most talented

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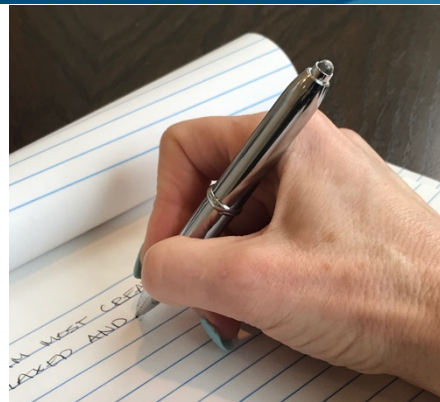Computing Research Association
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HW: Explain to Yourself

1. Permanence (time)

2. Pervasiveness (space)

3. Personalization (you or not you)

- Your paper gets accepted 🙂

Your paper gets rejected ☹

Next Layer

Fixed versus Growth Mindset

- Fixed Mindset
  - I am smart or not
  - I am athletic or not
  - I am empathetic or not … etc.
  - Success is because I am X
  - Failure is because I am not X or I am not X enough
- Growth Mindset
  - If I work hard, I can learn X

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Research Mindset for Research Life Events

I will

1. Counter my biases
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Have ideas

Work on ideas

Discuss ideas informally

Write up ideas

Submit paper

Give talk / teach class

Receive verbal feedback

Receive formal evaluation

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Resources & Exercises

Acknowledgements

- Inspired by Professor Samuel Kounev's course notes
- Professor Lori Pollock

Resources

- Carol Dwick, "Mindset: The New Psychology of Success"

- Martin Seligman, Learned Optimism, <u>Questionaire</u>

- Daniel Kahneman, "Fast versus Slow Thinking"

- Implicit Bias Testing, https://implicit.harvard.edu/

- Olivia Goldhill, "The World is Relying on a Flawed Psychological test to Fight Racism"

Discussion & Questions

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