Debugging your brain

What is a Cognitive Bias?

A systematic pattern of deviation from rationality in judgment

Subjective Probability: A Judgment of Representativeness by D. Kahneman and A. Tversky, 1972

Why do we have Cognitive Bias?

It's the evolution, baby!

- Speed over accuracy
- Mental efficiency
- Social cohesion

Confirmation Bias

The tendency to interpret and recall information in a way that confirms preexisting beliefs

Confirmation Bias

Confirmation Bias

Examples

- Choosing a framework because it worked well once, ignoring evidence of better alternatives
- Believe a bug is in a new module and only checks those code paths

Confirmation Bias

Hidden Costs

- Suboptimal technology choice
- Longer debugging sessions
- Reinforce resistance to new tools or methodologies

Confirmation Bias

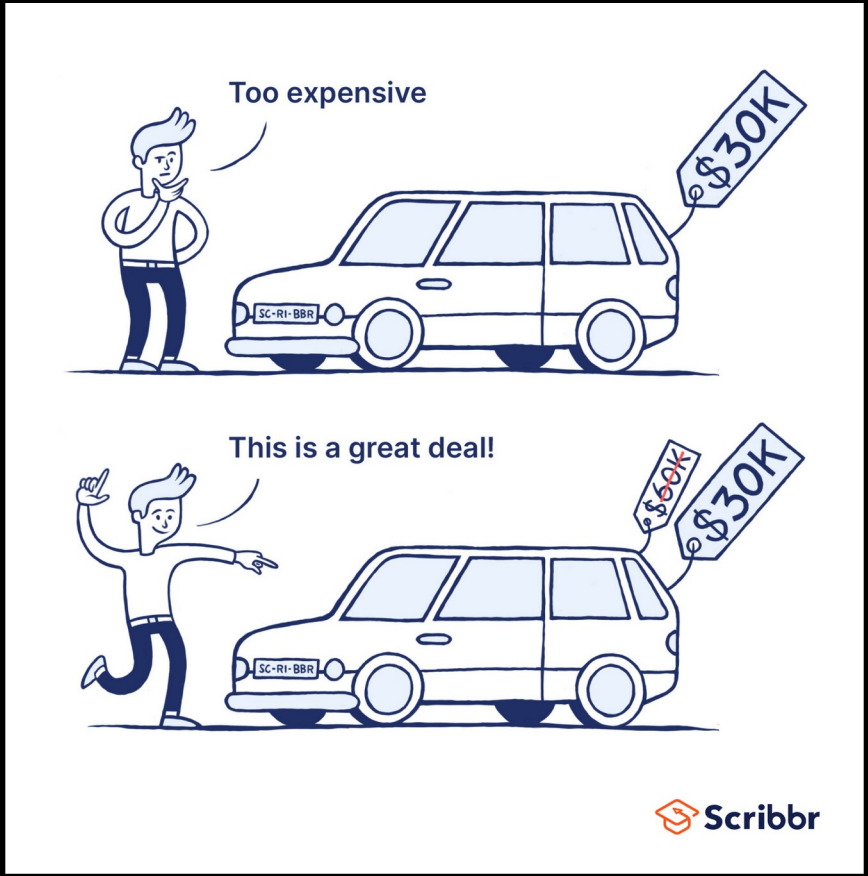
Mitigation Strategies

- Explicitly seek disconfirming evidence: someone to play devil's advocate
- Define measurable criteria before you start evaluating options

Anchoring Bias

Describes our tendency to rely too heavily on the first piece of information offered (the 'anchor') when making decisions

Anchoring Bias



Anchoring Bias

Examples

- Initial effort estimation heavily influence final project timelines
- A senior developer's quick guess ('minor configuration issue') anchors the team's perception of a bug's severity
- Fixating on the first error message or log line seen during a production incident
- Last salary as the anchor for new job offers

Anchoring Bias

Hidden Costs

- Inaccurate estimation
- Longer debugging sessions
- Disproportionate influence of the first number in negotiations

Anchoring Bias

Mitigation Strategies

- Estimate independently first
- Question the anchor's origin
- Use range estimates to acknowledge uncertainty
- Force a deliberate consideration of extremes (best-case and worst-case scenarios)
- Ask for the salary range instead of providing your last salary

Sunk Cost Fallacy

The tendency to continue investing in a decision based on cumulative prior investment despite new evidence suggesting it's not optimal

Sunk Cost Fallacy

Sunk Cost Fallacy

Examples

- Sticking with a technology/process because *We've already invested so much time*
- Persisting with a failing custom-built service when a commercial solution would be faster and cheaper

Sunk Cost Fallacy

Hidden Costs

- Wasting time and money on doomed projects or technical dead ends
- Team frustration and burnout
- Accumulation of technical debt

Sunk Cost Fallacy

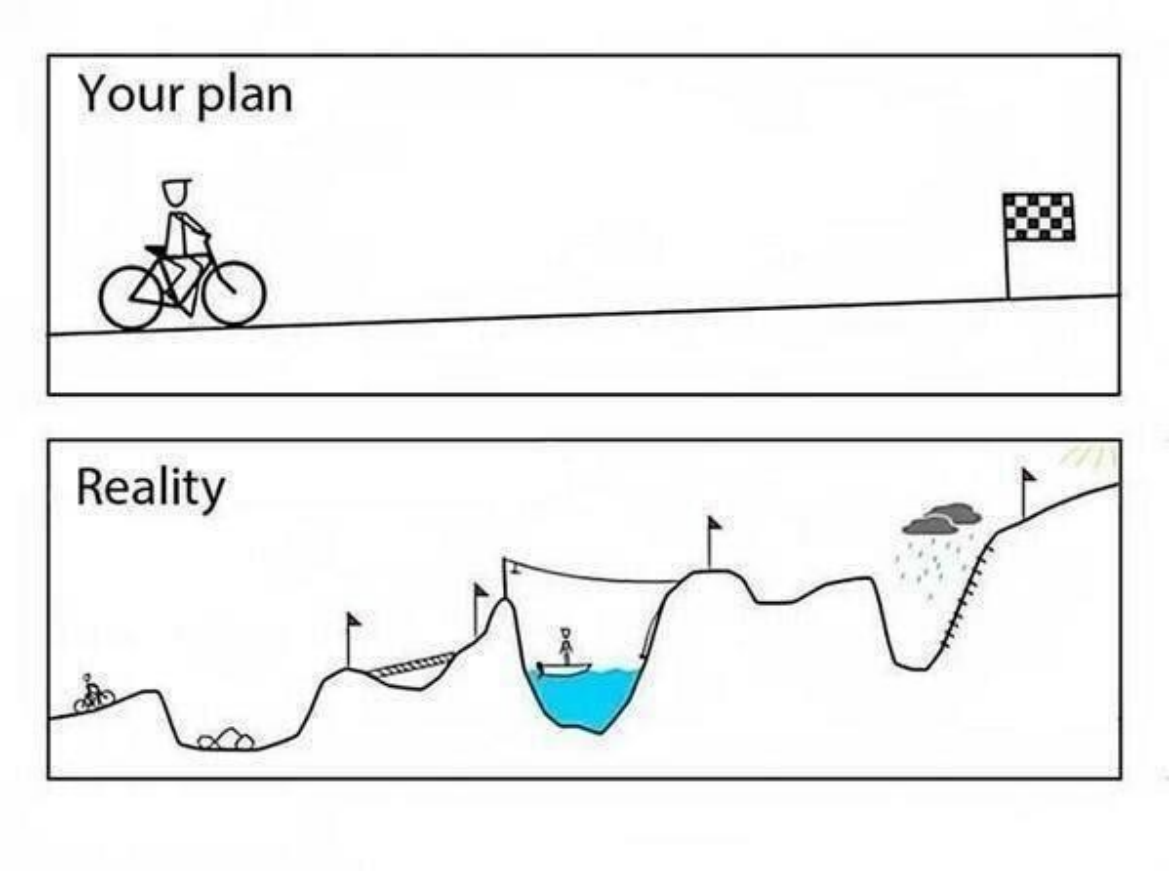
Mitigation Strategies

- Evaluate decisions based on future value only
- Regularly ask: 'If we hadn't started this, would we start it now?'
- Involve external reviewers (not emotionally invested)

The Planning Fallacy (and Optimism Bias)

The tendency to underestimate the time, effort, and risk involved in tasks, while overestimating the benefits

The Planning Fallacy (and Optimism Bias)



The Planning Fallacy (and Optimism Bias)

Examples

- Providing an estimation without accounting for meetings, interruptions, external dependencies, learning curves or unexpected bugs
- Assuming integration will be straightforward between complex systems because of successful ones in the past

The Planning Fallacy (and Optimism Bias)

Hidden Costs

- Unrealistic deadlines, missed milestones
- Chronic stress and burnout among development teams
- Technical debt creation as corners are cut to meet deadlines
- Damaged stakeholder trust

The Planning Fallacy (and Optimism Bias)

Mitigation Strategies

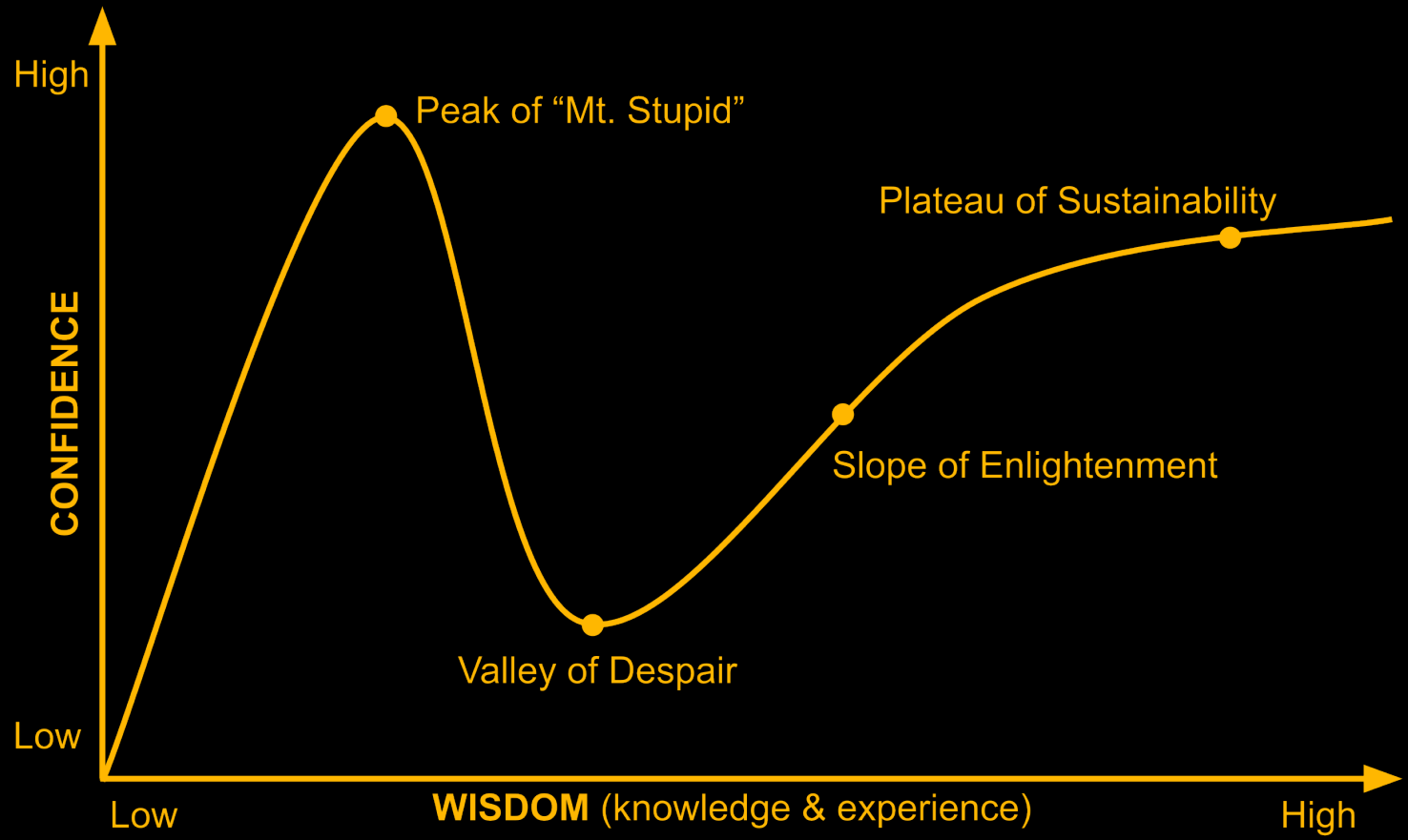
- Use historical data for estimates
- Break down tasks into the smallest possible pieces to expose hidden complexity
- Use ranges (best/worst case scenarios)
- Pre-Mortem Analysis: imagine the project has failed and brainstorm all the reasons why
- Add time buffers to estimates based on historical data

Dunning-Kruger Effect

The tendency for unskilled individuals to overestimate their ability while experts underestimate theirs

Dunning-Kruger Effect

Dunning-Kruger Effect



Dunning-Kruger Effect

Examples

- Junior developer claiming a complex feature will take a day, unaware of hidden complexities
- An experienced architect designs an overly abstract system, assuming 'this pattern is obvious'

Dunning-Kruger Effect

Hidden Costs

- Unrealistic commitments
- Poor technical decisions
- Delays from underestimating tasks by experts

Dunning-Kruger Effect

Mitigation Strategies

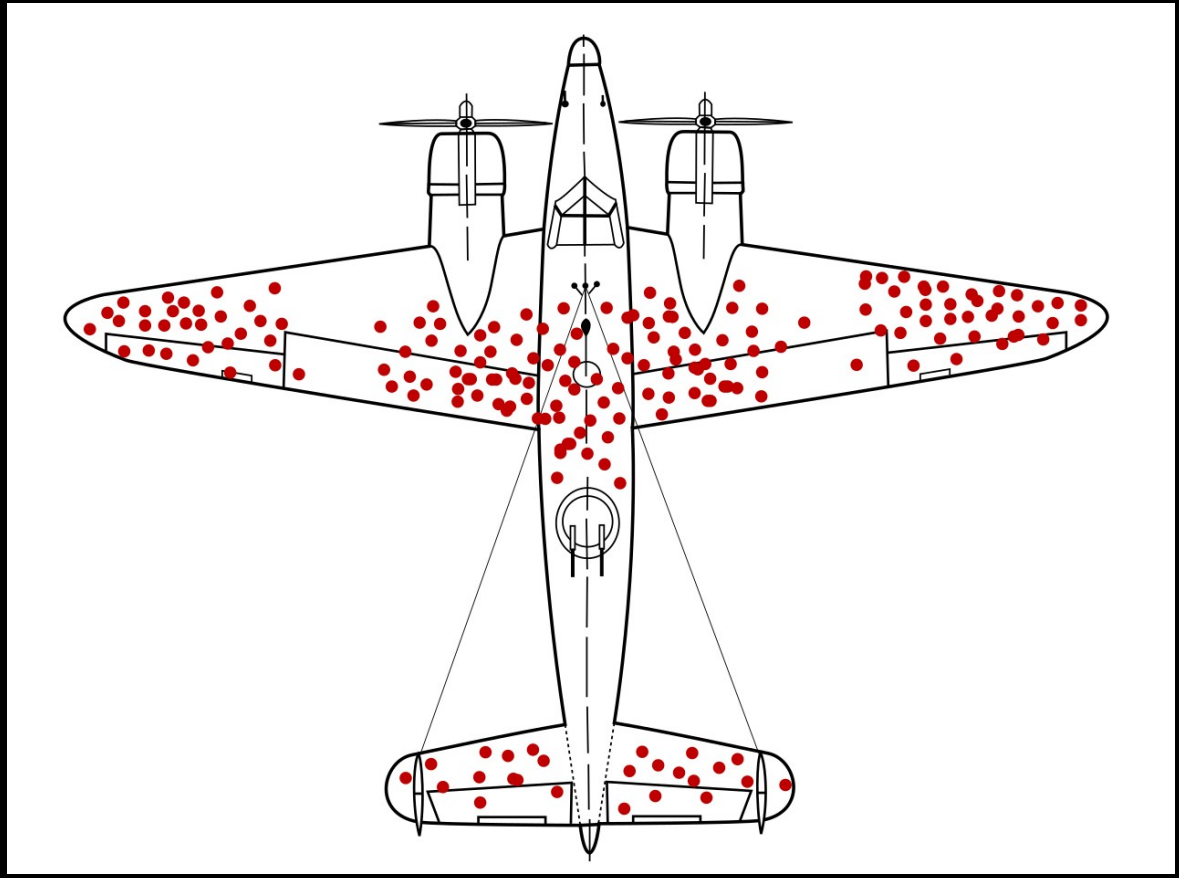
- Pair programming across experience levels
- Regular code reviews and feedback sessions
- Encourage a culture of continuous learning and humility

Survivorship Bias

Focusing on successful outcomes while ignoring those that failed, leading to a distorted view of reality

Survivorship Bias

Survivorship Bias



Survivorship Bias

Examples

- Choosing tools used by famous companies without considering unseen failures
- Copying architecture from successful projects without understanding why similar projects failed

Survivorship Bias

Hidden Costs

- Skewed understanding of success factors and strategies
- Overestimation of the effectiveness of certain approaches
- Missed lessons from failures that could inform better practices

Survivorship Bias

Mitigation Strategies

- Comprehensive analysis
- When possible seek out missing data
- Openly discuss failures and analyze them for learning

Break #1

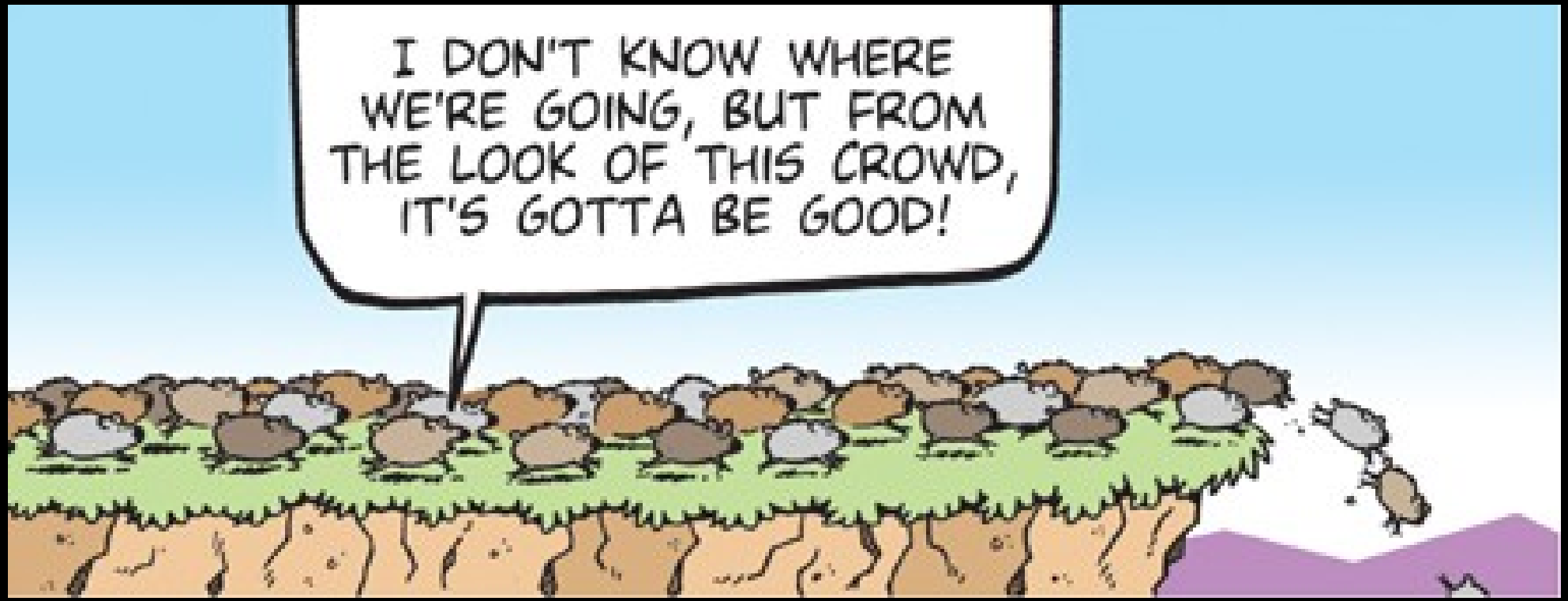
Seen so far

- Confirmation Bias
- Anchoring Bias
- Sunk Cost Fallacy
- The Planning Fallacy (and Optimism Bias)
- Dunning-Kruger Effect
- Survivorship Bias

Bandwagon Effect

The tendency to do or believe things because many other people do or believe the same

Bandwagon Effect



Bandwagon Effect

Examples

- A development team adopts a popular framework without thorough evaluation, because *everyone is using it*
- Microservices, Serverless, NoSQL, blockchain, Kubernetes, AR/VR, AI, etc

Bandwagon Effect

Hidden Costs

- Poor technology-fit decisions
- Wasted time/resources on learning and integrating tools that don't add value
- Missed innovative approaches

Bandwagon Effect

Mitigation Strategies

- Evaluate technologies against specific criteria
- Encourage diverse perspectives (safe environments for dissenting views)
- Designate devil's advocate in discussions
- Create POCs before building the real thing

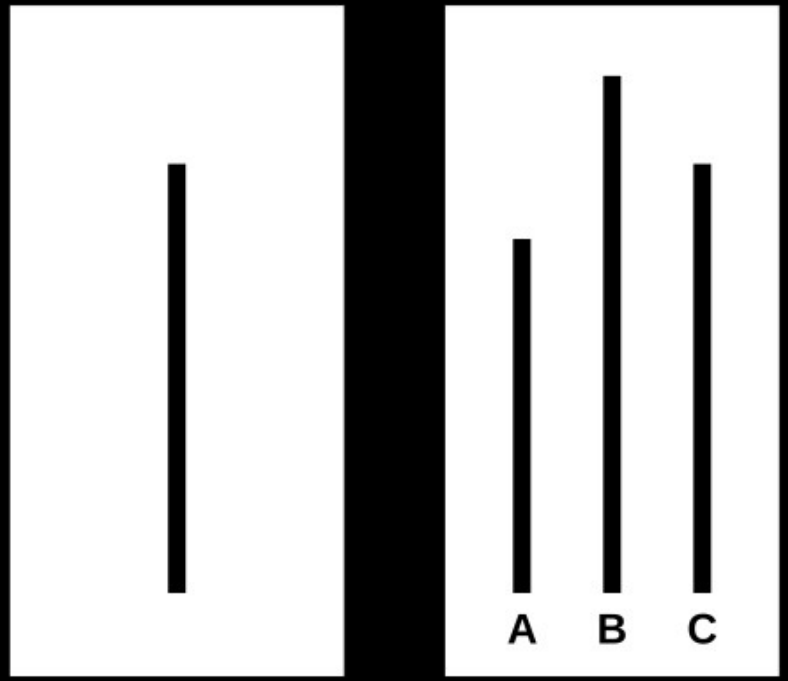
Groupthink

When a group values harmony or conformity over critical thinking, leading to irrational or dysfunctional decisions

Groupthink


I THINK THE GROUPTHINK THREAT IS EXAGGERATED!
SO DO I!
AND ME!
FRAN

Groupthink



https://en.wikipedia.org/wiki/Asch_conformity_experiments

Groupthink

Examples

- A team avoids discussing risks to maintain a positive atmosphere, leading to a flawed architecture
- All members agree on a solution without challenging assumptions, resulting in bugs
- Agreeing to unrealistic deadlines to avoid conflict

Groupthink

Hidden Costs

- Poor decision-making due to lack of critical evaluation
- Unmet deadlines
- Suppressed innovation and learning

Groupthink

Mitigation Strategies

- Take blind decisions
- Encourage open dialogue and anonymous feedback
- Designate devil's advocate

Ostrich Effect

The tendency to ignore or avoid negative information or situations, hoping they will go away on their own

Ostrich Effect

Ostrich Effect

Examples

- Ignoring technical debt and avoid addressing it
- Ignoring failing tests because *it's probably a flaky one*

Ostrich Effect

Hidden Costs

- Larger, costlier problems arising from ignored risks
- Accumulation of tech debt
- Reduced accountability and a culture of ignoring poor metrics

Ostrich Effect

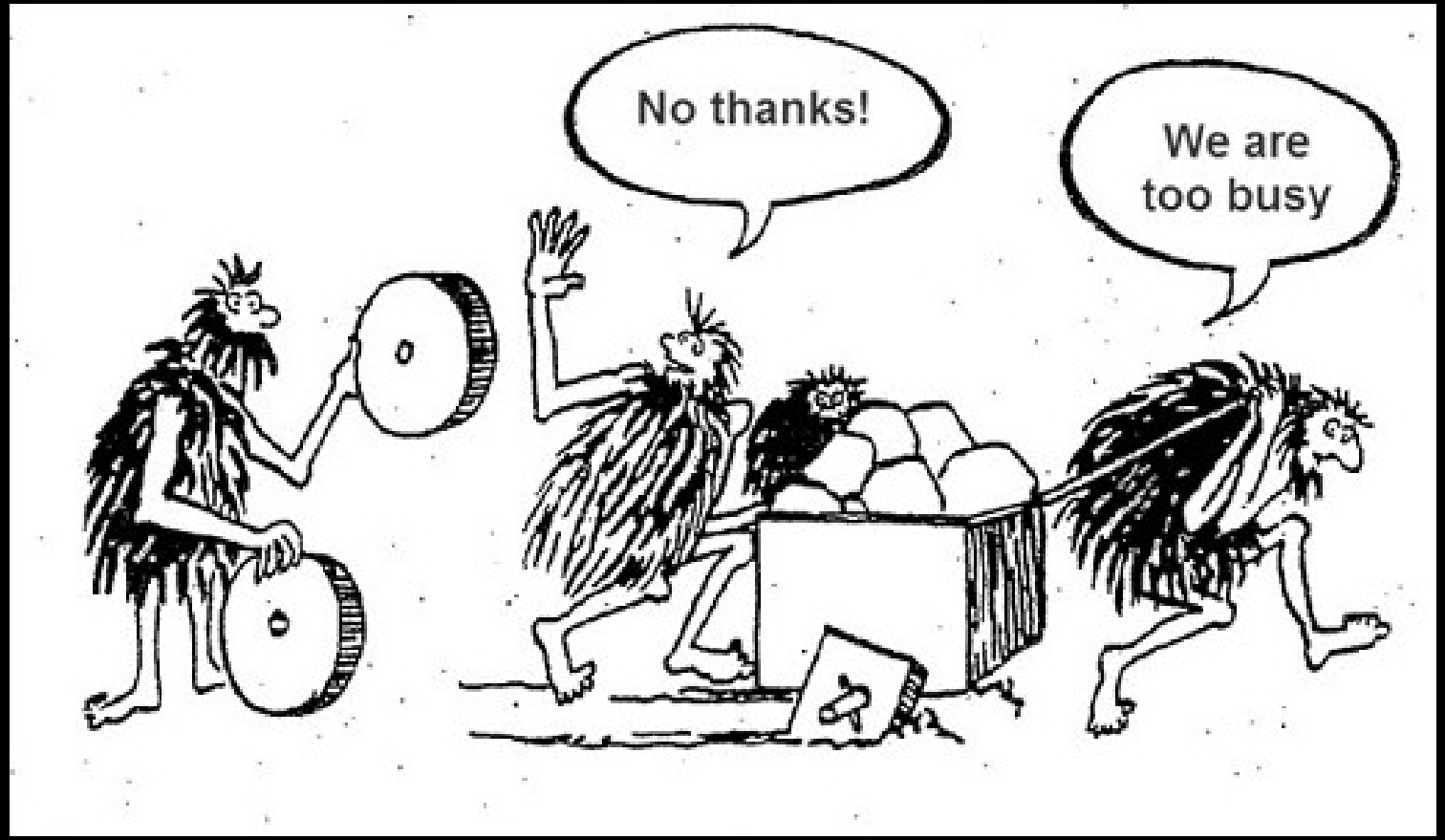
Mitigation Strategies

- Allocate dedicated time for reducing tech debt
- Implement monitoring and logging to detect issues early and allocate time for fixing them

Status Quo Bias

The preference to keep things the same by resisting change, even when alternatives may be better

Status Quo Bias



Status Quo Bias

Examples

- Use outdated technology despite newer options offering significant benefits
- Maintaining outdated processes because *that's how we've always done it*
- Avoiding refactoring legacy code despite its maintainability issues

Status Quo Bias

Hidden Costs

- Missed opportunities for improvement and innovation
- Increased maintenance costs and technical debt from outdated systems
- Higher risks due to security vulnerabilities
- Developer frustration and difficulty attracting new talent who prefer working with modern tools

Status Quo Bias

Mitigation Strategies

- Introduce new technologies via POCs
- Regular technology radar assessments
- Weigh the costs and benefits of change versus staying put
- Create innovation time or hackathons

Hindsight Bias

The tendency to see events as having been predictable after they have already occurred

Hindsight Bias

Hindsight Bias

Examples

- Overestimating the predictability of complex software outcomes
- Blaming teams for not foreseeing rare edge cases
- Looking back at a failed project and claiming *I always knew that technology was a mistake*, despite having agreed to it at the time

Hindsight Bias

Hidden Costs

- Impedes learning from past experiences by distorting our memory of events
- Creating frustration and blame within teams when outcomes are viewed as inevitable
- Creating a culture of fear of making decisions, as any failure will be deemed 'obvious' in retrospect

Hindsight Bias

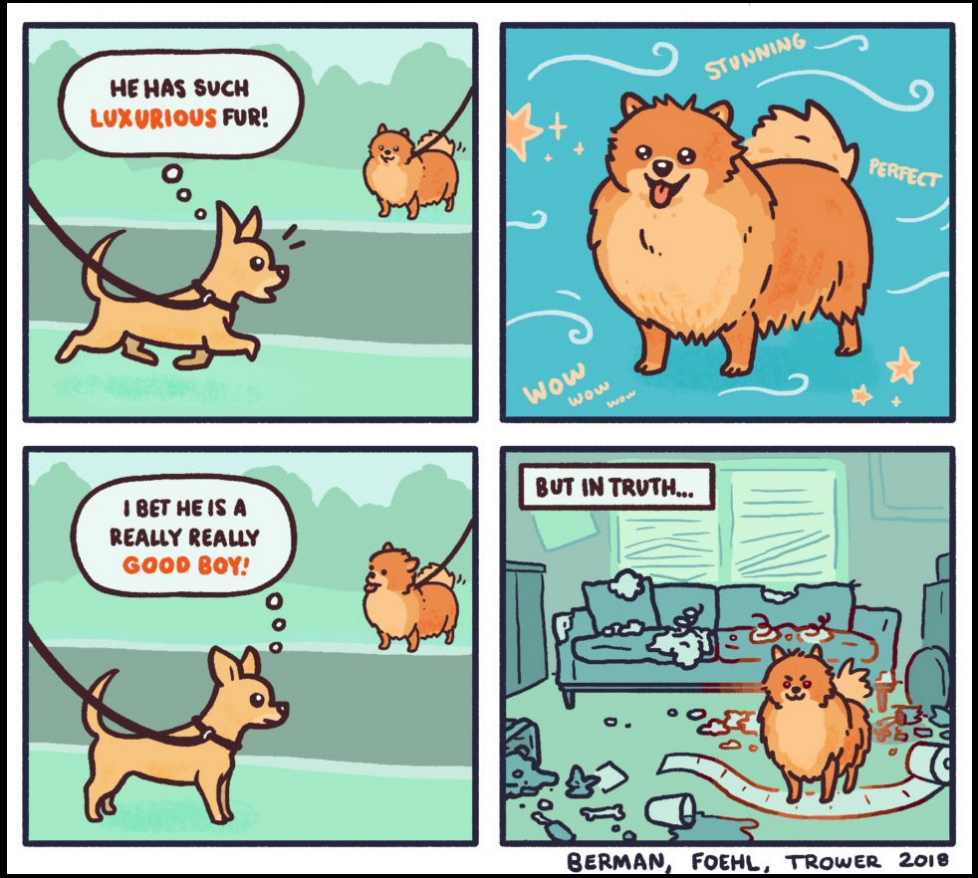
Mitigation Strategies

- Document decision-making processes and uncertainties
- Use pre-mortems to anticipate problems

Halo Effect

Letting the positive impression of one trait influence the perception of other unrelated traits

Halo Effect


HE HAS SUCH LUXURIOUS FUR!
STUNNING
PERFECT
WOW
WOW
WOW
I BET HE IS A REALLY REALLY GOOD BOY!
BUT IN TRUTH...
BERMAN, FOEHL, TROWER 2018

Halo Effect

Examples

- Assuming a developer is skilled in all areas because they excel in one
- Assuming code from a respected senior engineer needs less review
- A technology is favored because it's built by a 'cool' company even if lacking necessary features

Halo Effect

Hidden Costs

- Missed bugs in 'trusted' code
- Choosing technologies based on popularity rather than suitability
- Uneven code review standards
- Unchallenged bad ideas

Halo Effect

Mitigation Strategies

- Use standardized review checklists
- Rotate reviewers
- Blind code reviews when possible
- Evaluation matrix for technology selection

Break #2

Seen so far

- Bandwagon Effect
- Groupthink
- Ostrich Effect
- Status Quo Bias
- Hindsight Bias
- Halo Effect

Other biases impacting development

- Availability Heuristic
- Self-Serving Bias
- Fundamental Attribution Error
- IKEA Effect
- Not-Invented-Here Syndrome
- Curse of Knowledge
- Zero Risk Bias
- Loss Aversion
- Mere Exposure Effect
- Hyperbolic Discounting
- Negativity Bias

Wikipedia lists 188 cognitive biases: have fun!

Cultural Approach

Aviation

Medicine

Cultural Approach

Aviation		Medicine
• Focus on systemic factors, not individual		• Individuals are held personally responsible
• Reporting errors is encouraged	VS	• Errors are hidden because of sues
• Mandatory incident reporting		• Reporting is often voluntary
• Checklists / black boxes / redundancy		

Cultural Approach

Aviation		Medicine
• Focus on systemic factors, not individual		• Individuals are held personally responsible
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~ 300 deaths in accidents in 2024

(~9.5 billion passengers)

Cultural Approach

Aviation

- Focus on systemic factors, not individual
- Reporting errors is encouraged
- Mandatory incident reporting
- Checklists / black boxes / redundancy

~ 300 deaths in accidents in 2024

(~9.5 billion passengers)

VS

Medicine

- Individuals are held personally responsible
- Errors are hidden because of sues
- Reporting is often voluntary

~ 2,500,000 deaths in medical errors in 2024

(~8.2 billion human beings)

Q&A

Slides available at: