INFOVIS REDESIGN

1. Theory – Critical Engagement with Visualization Methodologies

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BlueDot Observatory → AI Critique
                         ├── Pros
                         │     ├── background water texture isn't distracting
                         │     ├── Map with blue dots is effective
                         │     ├── clear labels and color scheme
                         │     └── Good historical trend
                         └── Cons
                               ├── text on left panel should be bolder and larger
                               ├── legend isn't explained
                               └── contrast between text elements and background could be improved

AI Critique → Critique of response
                  ├── repeats the same content constantly
                  ├── makes up pros
                  └── contradicts itself
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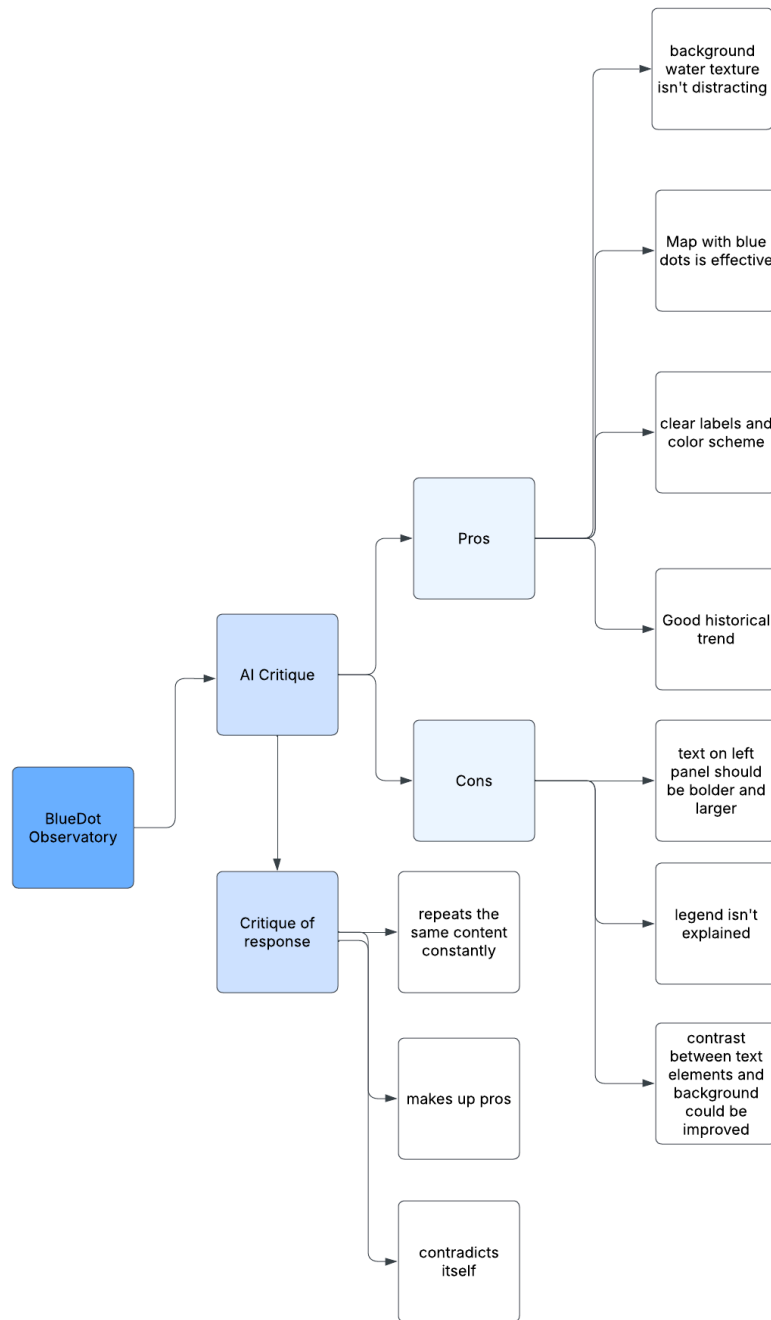
Figure 4: Flowchart of Ai Critique and Response

Figure 4 showcases how AI critiqued Amazon's BlueDot Observatory Visualization and my response to its critique. Some of the key details that I noticed from the critique was that the AI focused a lot on the visual aspect of the visualization. Perhaps it thought the data was perfect or shows a lack of interpretation in data representations or data abstraction which simplifies complex information to reveal patterns and insights (Bertin, 1983). The AI only fixes on visual clarity without saying anything about the data on how it was selected, framed or transformed. I feel it also demonstrates signs of algorithmic bias showing a tendency to create user-friendly responses. Instead of a critical review it kept a ratio of 3 compliments to 1 criticism suggesting it may seek for user satisfaction instead of accuracy (Eubanks, 2018)

References:

Amazon Web Services. "BlueDot Observatory: Keeping an Eye on Our Planet's Water Resources." *AWS Public Sector Blog*. Accessed March 30, 2025.

OpenAI. *ChatGPT*. Accessed March 30, 2025.

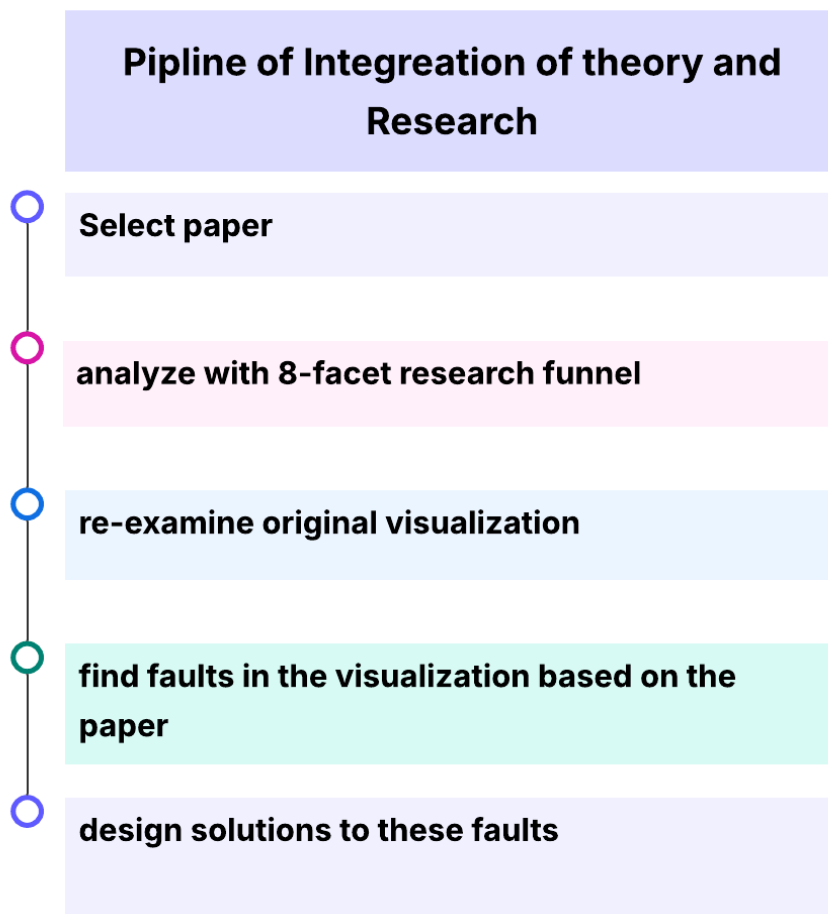https://www.youtube.com/watch?v=tBWMOSrASkE&t=1s

Bertin, J. (1983). *Semiology of Graphics: Diagrams, Networks, Maps*. University of Wisconsin

Press.

Eubanks, V. (2018). *Automating Inequality: How High-Tech Tools Profile, Police, and Punish

the Poor*. St. Martin's Press.

2. Research – Literature-Inspired Analysis

The paper "Perception! Immersion! Empowerment! Superpowers as Inspiration for Visualization" rethinks the design of visualization systems by drawing metaphors to fictional powers. It puts a strong emphasis on perceptual optimization and ties into how data visualizations need more visual clarity. Visualizations should not only be interactive but also be contextually and perceptually optimized. Along with that it focuses on interactivity drawing on how superheroes have full control over their abilities. Overall visualizations should be more intuitive. They also want to encourage going beyond screen-based visualizations and using augmented / mixed reality and have seven sections that they believe are in need of improvement, "*scope, access, spatial relevance, temporal relevance, information richness, degree of control,* and *environmental reality*"(W. Willett). The blue dot project could benefit from these aspects by being more interactive and intuitive. Currently, without the background text provided on the website the visualization would make little sense which is an issue since most people would not read everything. It should be understandable at first glance. In my redesign I plan to solve this issue.

REDESIGN WORKFLOW:

Pipline of Integreation of theory and Research

- Select paper
- analyze with 8-facet research funnel
- re-examine original visualization
- find faults in the visualization based on the paper
- design solutions to these faults

References:

W. Willett et al., "Perception! Immersion! Empowerment! Superpowers as Inspiration for
    Visualization," in IEEE Transactions on Visualization and Computer Graphics, vol. 28,
    no. 1, pp. 22-32, Jan. 2022, doi: 10.1109/TVCG.2021.3114844.

Amazon Web Services. "BlueDot Observatory: Keeping an Eye on Our Planet's Water
    Resources." *AWS Public Sector Blog*. Accessed March 30, 2025.
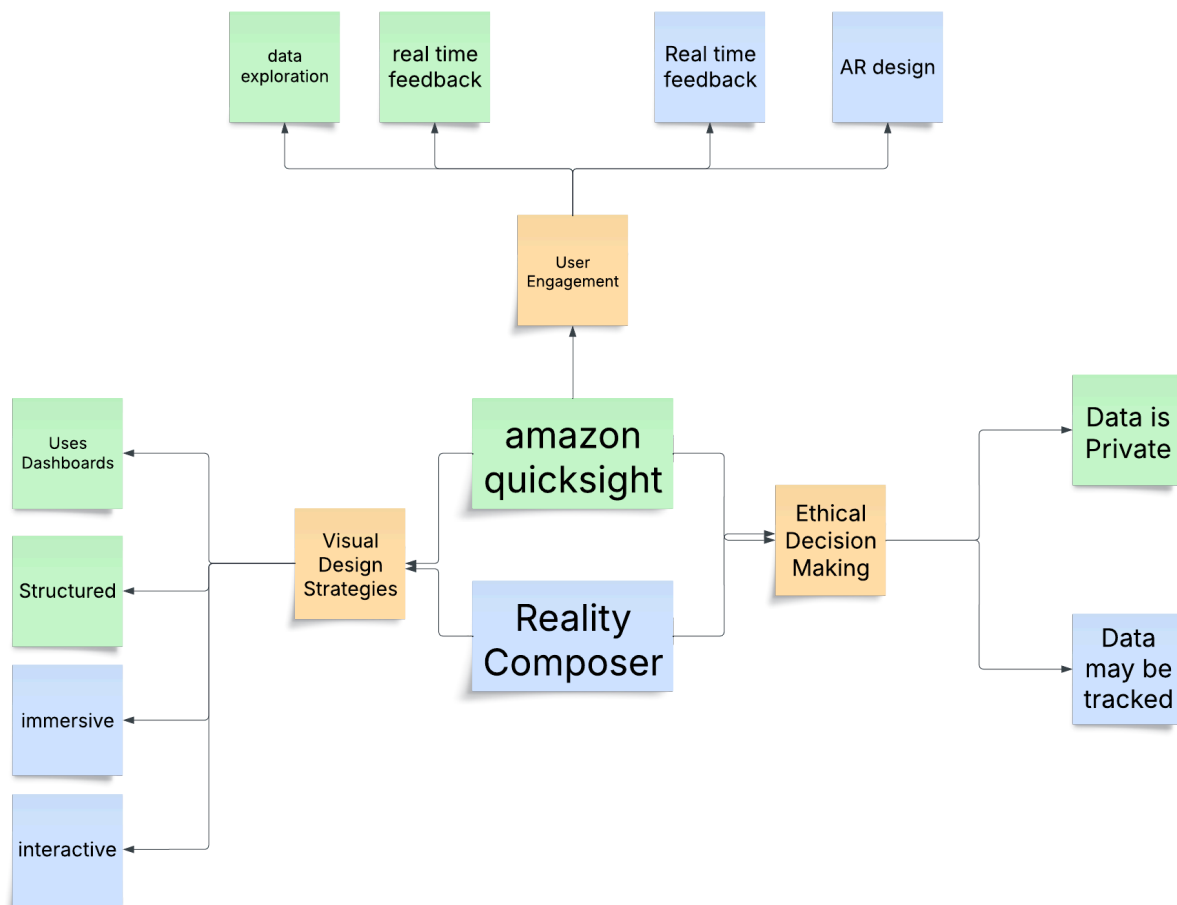
3. Practice – Tool-Driven Redesign Preparation

Figure 7: Comparison of Amazon QuickSight and Reality Composer

Both of these services give unique approaches towards design, ethics, and user engagement. As seen in figure 7, QuickSight focuses more on data visualization with dashboards which gives a structured approach compared to Reality composer which is centered around the AR experience. Both priority user engagement and show real time feedback but Quicksight focuses on data exploration while Reality Composer is focused on AR design. Ethical considerations that impact both services are data privacy regulations. Quicksight believes that, "AWS is responsible for protecting the global infrastructure that runs all of the AWS Cloud. You are responsible for maintaining control over your content that is hosted on this infrastructure" (Amazon Web Services, 2025). Reality Composer which is made by Apple has more loose regulations as they say that, "The following data, which may be collected but is not linked to your identity, may be used for the following purposes: Analytics: Usage Data"(Apple Inc., 2025). Both do a great job at making the process intuitive and easy to use.

For this redesign I would use Amazon Quicksight since it is better equipped to handle the data and create a new visualization.
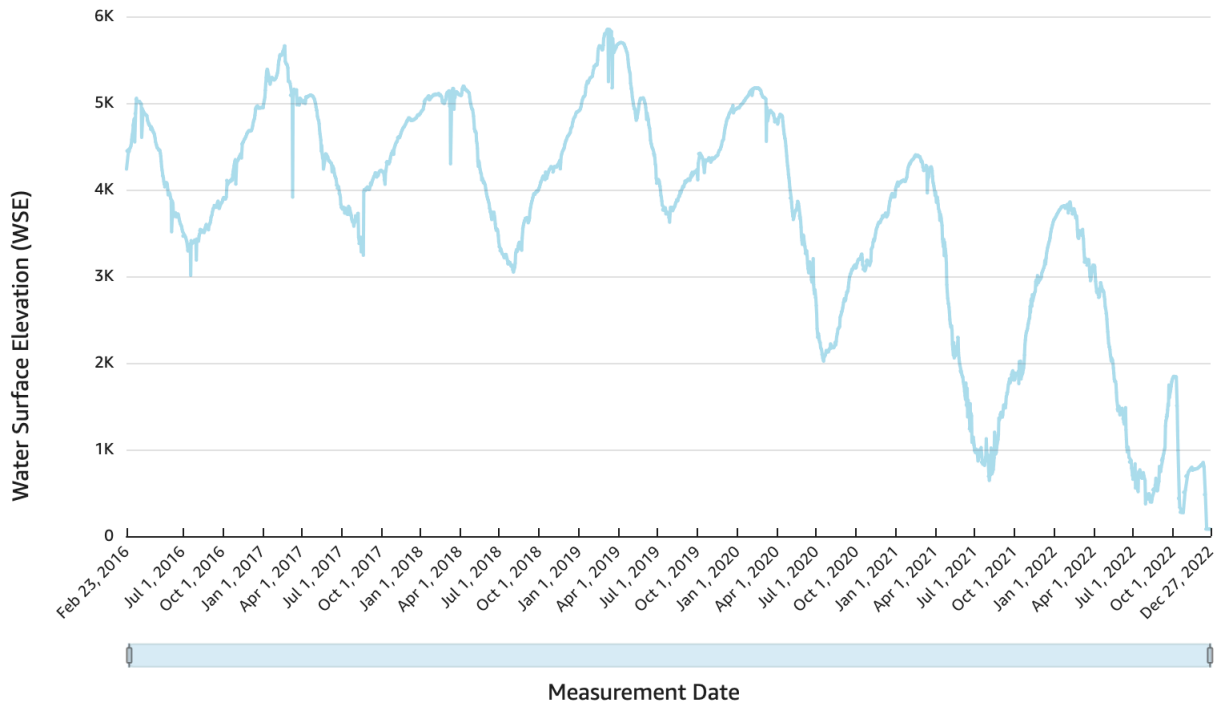
References:

Amazon Web Services. (2025). *Data protection in Amazon QuickSight*. Retrieved from
https://docs.aws.amazon.com/quicksight/latest/user/data-protection.html

Apple Inc. (2025). *Reality Composer*. Retrieved from
https://apps.apple.com/us/app/reality-composer/id1462358802

4. Innovation – Final Redesign and Integration

Groundwater Levels Over Time by Station (WSE)
SHOWING TOP 2500 IN MSMT_DATE

Water Surface Elevation (WSE) vs Measurement Date

Redesign:

This is a visualization that showcases the message that the BlueDot Observatory is trying to send, that water levels are falling, in a much more intuitive and understandable way. It shows the trend of water levels falling and is understandable even if only reading the labels as suggested by Willett et al. The data is also easily accessible and compliant with fair principles.

Link:

https://us-west-2.quicksight.aws.amazon.com/sn/analyses/93a4127a-5d3f-4f78-8a88-6d1225fab8 e5

References:

Amazon Web Services. (2025). *Data protection in Amazon QuickSight*. Retrieved from https://docs.aws.amazon.com/quicksight/latest/user/data-protection.html

Amazon Web Services. "BlueDot Observatory: Keeping an Eye on Our Planet's Water Resources." *AWS Public Sector Blog*. Accessed March 30, 2025.
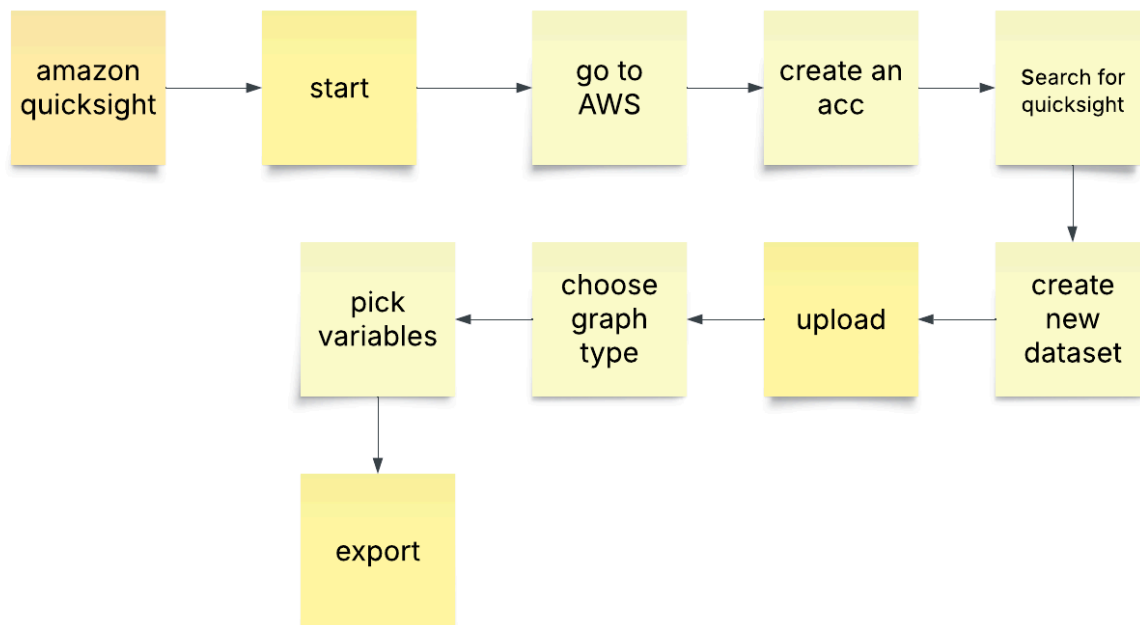
W. Willett et al., "Perception! Immersion! Empowerment! Superpowers as Inspiration for Visualization," in IEEE Transactions on Visualization and Computer Graphics, vol. 28, no. 1, pp. 22-32, Jan. 2022, doi: 10.1109/TVCG.2021.3114844.

Farahmandfar, A. (2023). Continuous Groundwater Level Measurements - 2023. Kaggle. https://www.kaggle.com/datasets/alifarahmandfar/continuous-groundwater-level-measurments-2023

Github:
https://github.com/jiiean/redesign

Implementation Process:

SDG Goal Contribution

My project works with SDG goal 6. Goal 6 focuses on clean water and sanitation with a focus on ensuring availability and sustainable management of water and sanitation for all. My project targets the availability portion of this goal to highlight how water levels have been dropping. It brings environmental awareness to the real problem of drinking water and promotes change.

Zhouzhuang Mystery of Life Museum

I think in the future we could create AR/VR visualizations of the bones and muscles of animals and humans. From the field a lot of people were disgusted by the use of real dead bodies. Using visualizations allow the viewer to inspect and learn without the feeling of disgust and better absorb the information. The VR/AR aspect allows people to learn from anywhere, and allows for better learning since they can zoom in and zoom out, and move around the body and take apart and see beneath certain muscles for better comprehension.

From the museum, I learned that the visualization doesn't just have to be accurate and informational, it should also be designed in a way that does not scare the viewer from viewing. The Zhouzhuang Mystery of Life Museum really failed at this aspect.