Augmenting Static Visualizations with PapARVis Designer. Chen, et al. CHI. 2020.

What are the core research questions addressed by the work?
- How do we design hybrids of physical static and virtual AR-visualizations that are graphically consistent, readable, and valid?

What motivates the work?
- Visualizations on paper (in the form of posters, newspapers, scientific reports, etc.), due to its low-tech and tangibility, makes it very simple to create, distribute, view, and engage with the visualization content; viewers can freely engage with them through touch, pen and annotation, sharing thoughts and discussion in a collaborative setting
- Paper visualizations have the drawback of being static and limited in both space and time
- Augmented Reality (AR) allows for dynamic and interactive content and therefore has the potential of extending static paper visualizations

How does the work understand the usage, capabilities, and limitations of paper?
- Low-tech, tangible
- Enables easy creation, distribution, viewing, and engagement with content
    - Enables viewing in-situ without specific hardware
    - Engagement through touch, pen, and annotation
    - Conducive to discussions in a collaborative setting
- Static
- Limited in space and time

What is the target application domain of the work?
- Data visualization
- Paper explicitly envisions uses for visualizations in public displays, education, and creative products, but notes that the proposed application domains is not comprehensive

What are some proposed extensions to paper proposed by the work?
- The paper lists the following benefits of augmenting static visualizations: Overcoming spatial limitations of paper, keeping displayed information up to date, providing complementary information (information extension), enabling showing of detail on demand (alternative views to the presented information on a printed visualization), protecting user privacy

How are the proposed extensions implemented?
- Marker-based AR with Vuforia for the actual AR use component, though the design tool and procedure involves a Vega-based editor and a cloud server

What are the results of the work? What are the implications of the results for future designs and implementations of paper-based technologies?
- Discussion is more focused on the design process of AR extensions to static paper visualizations. The gap between reality and virtuality during creation is noted as one area needing future investigation.
- From a technical standpoint, misalignments between virtual and physical content (as a result of both issues with AR technology and visual encodings for data visualization) and occlusions present problems to users