Interactive Visualizations

Interactive Knowledge Graph Visualizations

This page demonstrates how to explore the mathematical knowledge graph through interactive visualizations.

PyVis Interactive Graphs

We've generated interactive visualizations for all nodes in the knowledge graph using PyVis. These visualizations allow you to:

- **Explore local neighborhoods**: Each node visualization shows its immediate dependencies and dependents
- **Interact with the graph**: Zoom, pan, and hover over nodes to see details
- **Understand relationships**: Directed edges show how concepts depend on each other

Individual Node Visualizations

Each mathematical concept has its own interactive graph showing its local neighborhood. Here are some examples:

- Group Definition Interactive Graph
- Vector Space Interactive Graph
- Topological Space Interactive Graph

Domain Overview Visualizations

We also provide domain-level visualizations showing all concepts within a mathematical field:

- Algebra Domain Overview
- Topology Domain Overview
- Analysis Domain Overview

Complete Visualization Index

For a complete list of all available visualizations, visit the Interactive Visualization Index.

Embedding Visualizations in Quarto

Method 1: Direct Links

The simplest way is to link to the standalone HTML files as shown above.

Method 2: IFrame Embedding

You can embed visualizations directly in your Quarto pages using iframes:

Method 3: Observable JS Integration (Coming Soon)

We're working on integrating D3.js visualizations directly into Quarto pages using Observable JS, which will allow for:

- Dynamic data loading
- Custom filtering and search
- Integration with other page content
- Responsive design

Understanding the Visualizations

Node Types and Colors

- **Definitions** (Green boxes): Fundamental concepts
- **Theorems** (Blue ellipses): Proven statements
- **Axioms** (Orange diamonds): Foundational assumptions
- **Examples** (Purple squares): Concrete instances

Graph Layout

The graphs use a force-directed layout that: - Places closely related concepts near each other - Shows the flow of dependencies with directed arrows - Allows interactive exploration through physics simulation

Navigation Tips

- **Click and drag** nodes to rearrange the layout
- **Scroll** to zoom in/out
- **Hover** over nodes to see detailed information
- Use the **navigation buttons** for better control

Technical Details

These visualizations are generated automatically as part of our build pipeline:

1. The knowledge graph is built from Quarto content
2. PyVis creates interactive HTML files for each node
3. Domain overviews aggregate related concepts
4. All visualizations are updated when content changes

For developers interested in the implementation, see: - Visualization module: `viz/pyvis_graphs.py` - Build script: `scripts/generate_pyvis.py` - CI/CD integration: `.github/workflows/build.yml`