I've created a comprehensive 3D geological domain modeling system with structural controls and boundaries. Here's what I've implemented:

Key Features

1. **Geological Domain Types**

- **Lithological domains**: Rock type classifications with mineral composition
- **Alteration domains**: Hydrothermal and metamorphic alteration zones
- **Mineralization domains**: Ore zones with grade statistics and paragenesis
- **Structural domains**: Deformation zones and fabric analysis
- **Geochemical/Geophysical domains**: Anomaly zones and signatures

2. **Structural Controls**

- **Faults**: With displacement, kinematics, and movement sense
- **Folds**: Axial traces, plunge, and fold geometry
- **Contacts**: Conformable, unconformable, and intrusive contacts
- **Veins/Dikes**: Orientation and geometric properties
- **Fractures/Joints**: Spacing and orientation data

3. **3D Wireframe Generation**

- **Multiple algorithms**: Convex hull, alpha shapes, Delaunay triangulation
- **Data sources**: Drill holes, block models, interpretation points
- **Quality metrics**: Topology validation, smoothness, completeness
- **Export formats**: GOCAD, OBJ, PLY, JSON

4. **Domain Analysis Tools**

- **Intersection analysis**: Volume calculations between domains
- **Continuity analysis**: Spatial, grade, and structural continuity
- **Validation system**: Geometric, geological, statistical validation
- **Confidence assessment**: Multi-criteria confidence scoring

5. **3D Visualization**

- **Interactive viewer**: Pan, zoom, rotate, select domains

- **Rendering modes**: Solid, wireframe, transparent
- **Color coding**: By type, confidence, volume, age
- **Structural overlays**: Constraints, measurements, labels

6. **Advanced Features**
- **Hierarchical domains**: Parent-child relationships
- **Temporal constraints**: Relative and absolute timing
- **Paragenetic sequences**: Mineral deposition stages
- **Grade continuity**: Spatial correlation analysis
- **Export/Import**: Multiple industry-standard formats

Usage Examples
1. **Create lithological domains** from drill hole intersections
2. **Define structural constraints** like faults and folds
3. **Generate wireframes** using various algorithms
4. **Validate domain geometry** and geological consistency
5. **Analyze domain intersections** for resource estimation
6. **Export models** for mine planning software

The system provides a complete workflow for geological domain modeling with professional-grade tools for structural geology, resource estimation, and 3D visualization.