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## DrillDown: An Open-Source Python Package for “Drilling Down” Into Ore Deposits Datasets

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Even as the metal demands of the Global Energy Transition have increased, the rate at which new ore deposits are discovered has fallen. In response, members of industry and the research community are collecting datasets of increasing size and diversity along drillholes, the only means by which deposits can be sampled at depth. At the same time, the tools by which we integrate, visualize, and analyze such drillhole datasets have not significantly evolved. Existing tools exhibit shortfalls, not least of which are their high license fees. They are also generally closed-source, OS-limited, and siloed, particularly from the diverse collection of tools that make up the broader Python Scientific Ecosystem.

DrillDown is a python toolkit for visualization and analysis involving drillhole datasets. It provides functionality for constructing drillholes from collar, survey, and one or more downhole datasets, which may include interval data (e.g., assays or lithologies) or point data (e.g., structural measurements or sample locations). Drillholes and associated downhole datasets can be visualized in 3-D along with other meshes (e.g., ore grade shells or DEMs). DrillDown weaves together both cursor-based and programmatic ways of interrogating datasets, including cursor-based selection in 3-D, boolean filtering, and cross-filtering between the 3-D scene and a variety of 2-D plots. This rich functionality is best leveraged when DrillDown is paired with jupyter notebooks, resulting in interactive and shareable analyses. For example, data selected in 3-D can be accessed in a jupyter notebook directly for further programmatic analysis.

DrillDown is free, open-source, and hosted on GitHub, promoting community contribution, transparency, and extensibility. As an open-source python package, DrillDown can be readily paired with other python packages. In this way, it both serves as a jumping off point for bringing the Python Scientific Ecosystem to bear on ore deposits problems and as a springboard for the geoscientist-turned-novice-programmer.