

# Automated Web Layer Updates with Pandas and the ArcGIS API for Python

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**All code in this presentation  
is available on github:**

**[github.com/agrc/presentations](https://github.com/agrc/presentations)**

**[github.com/agrc/palletjack](https://github.com/agrc/palletjack)**





# How do I go from this...

SW & UOCC Map Data

File Edit View Insert Format Data Tools Extensions Help

100% Arial 10 B I A

A1 fx Status

	A	B	C	D	E	F	G
1	Status	Class	Facility Name	Facility Type	ID#	County	Latitude
2	Open	I	Beaver County SSD 5 MSW Landfill	Landfill	89	Beaver	38.3056
3	Open	IVb	Beaver County SSD 5 CD Landfill	Landfill	90	Beaver	38.26895
4	Open	I	Box Elder-Little Mountain MSW Landfill	Landfill	91	Box Elder	41.60222
5	Open	IIIb	Western Metals	Landfill	92	Box Elder	41.89333333
6	Open	IIIb	ATK Launch Systems-Promontory Landfill	Landfill	93	Box Elder	41.69389
7	Open	IIIb	Nucor Steel	Landfill	94	Box Elder	41.87694
8	Open	II	Utah Test and Training Range-Oasis MSW Landfill	Landfill	95	Box Elder	41.05694
9	Open	I	Logan City-Cache County MSW Landfill	Landfill	97	Cache	41.73167
10	Closed	IVb	Logan City-Cache County CD Landfill	Landfill	98	Cache	41.73167
11	Open	IVb	Carbon County Landfill	Landfill	99	Carbon	39.60031
12	Open	I	Wasatch Integrated Waste Management District MSW Landfill	Landfill	100	Davis	41.11778
13	Closed	NA	Wasatch Integrated Waste Manag. District/Incinerator	Incinerator	101	Davis	41.109168
14	Open	V	ECDC Environmental	Landfill	102	Carbon	39.53624
15	Open	I	Bountiful City MSW Landfill	Landfill	103	Davis	40.90757
16	Closed	VI	Dalton Brothers/Lost Creek Landfill	Landfill	104	Piute	38.14583333
17	Open	IIIb	Intrepid Potash-Moab Landfill	Landfill	105	San Juan	38.51472
18	Open	NA	Canyonlands Transfer Station	Transfer Station	107	Grand	38.538263
19	Open	NA	Salt Lake Valley SWMF-Transfer Station	Transfer Station	108	Salt Lake	40.70111111
20	Closed	NA	Waste Management C/D Transfer Station	Transfer Station	109	Salt Lake	40.75722222
21	Closed	IIIb	Circle Four Farms	Landfill	110	Iron	38.11861111

+ SW Facilities UOCCs Electronic Recycle Convert

# To this?



UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY  
WASTE MANAGEMENT & RADIATION CONTROL

## Utah Recycling and Solid Waste Facility Locator

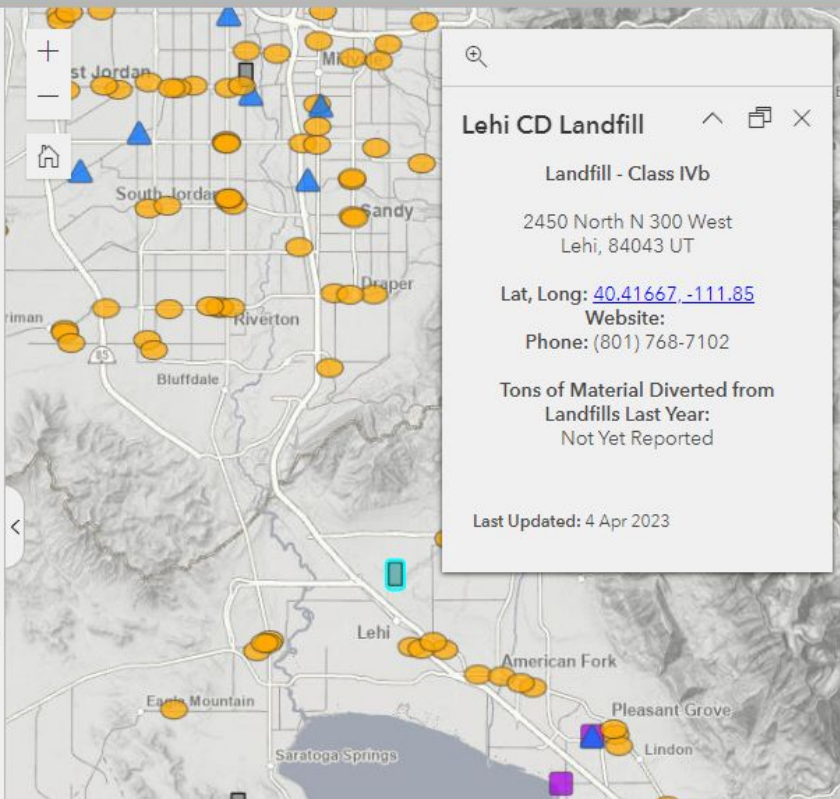
### Recycling and Solid Waste Facilities

- Compost or Other Food Management Facility
- Incinerator
- Land Treatment or Landspreading Facility
- Landfill
- Recycling Facility
- Transfer Station
- Used Oil Collection Center (UOCC)
- Waste Tire Facility

### Glossary

MSW: Municipal Solid Waste  
CD: Construction and Demolition

[Click here for detailed](#)



Filter By County

County Name

- All -

Filter by Facility Type

Facility Type

- All -

Accepts Material from the Public (Contact the facility for information)

Search for Certified Electronics Recyclers:

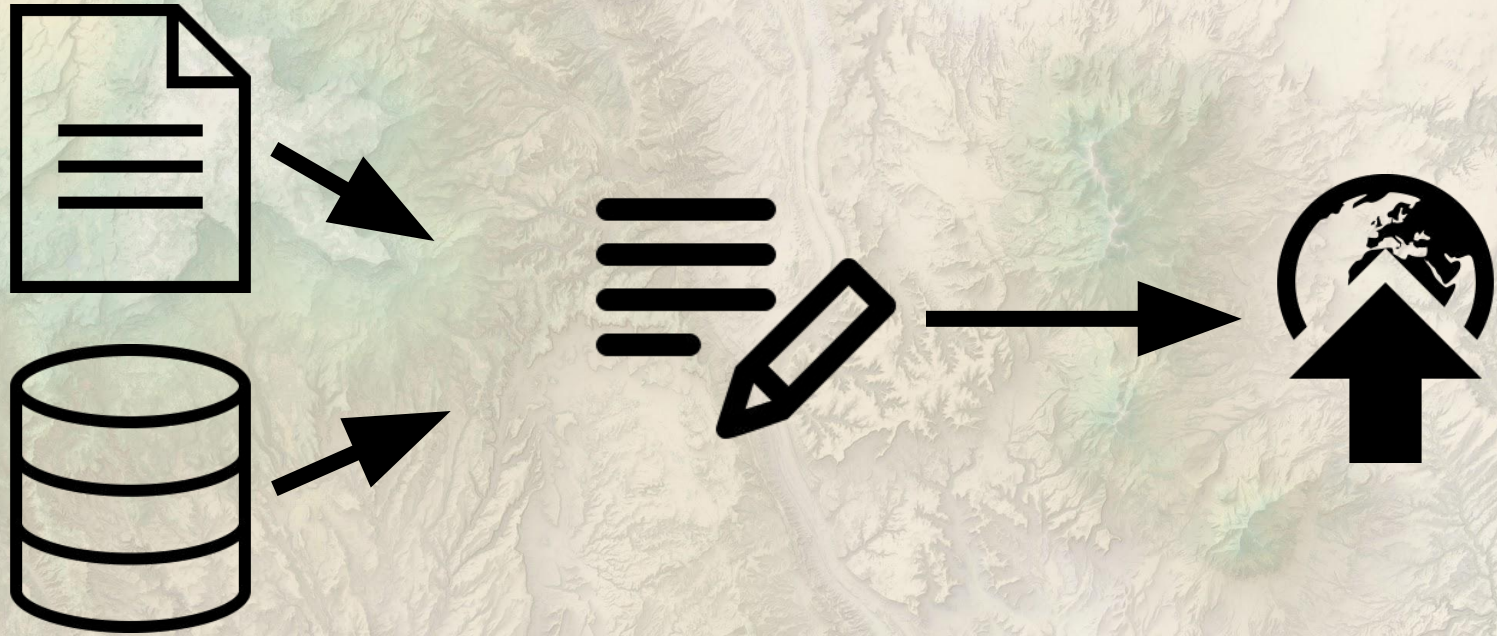
- [e-Stewards](#)
- [R2](#)

Search for recycling facilities by material type:

- [Earth911](#)



# Extract, Transform, Load



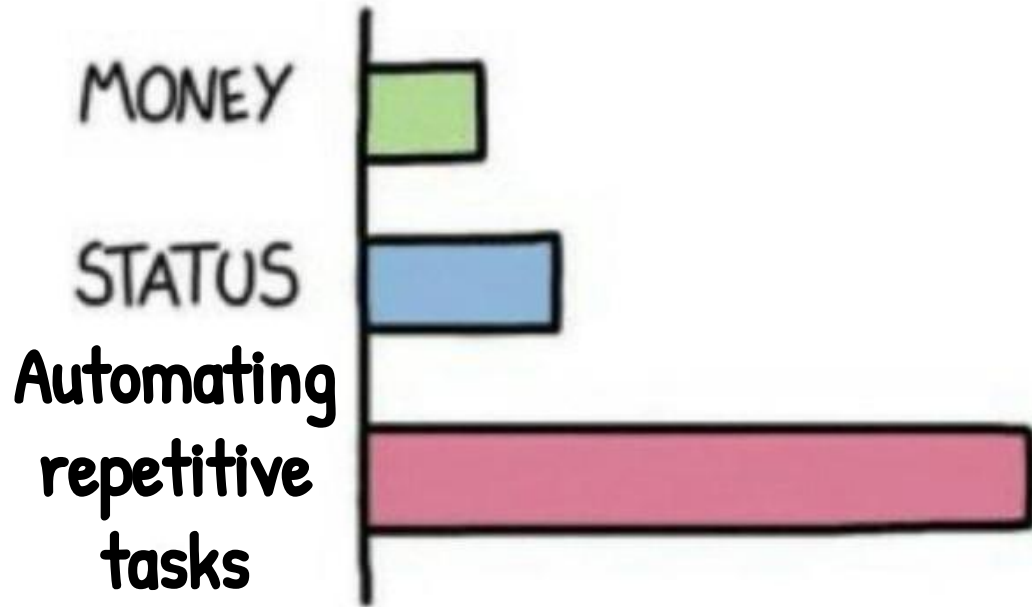
# Doing it the Hard Way

The screenshot shows the ArcGIS Desktop interface. On the left, the Drawing Order pane is open, showing a list of layers: dev summit, dev\_summit\_counties (selected), and Utah Terrain Basemap. The main menu is open, displaying various options such as Copy, Paste Properties, Remove, Group, Attribute Table, Data Engineering, Data Design, Create Chart, New Report, Joins and Relates, Zoom To Layer, Selection, Label, Labeling Properties..., Symbology, Disable Pop-ups, Configure Pop-ups, Data, Sharing, View Metadata, Edit Metadata, and Properties. The 'Data' menu item is selected, and a data table for 'dev\_summit\_counties' is displayed. The table has columns for name, fips, pop\_lastcensus, pop\_currestimate, and fips. The 'Overwrite Web Layer' option is highlighted in the context menu.

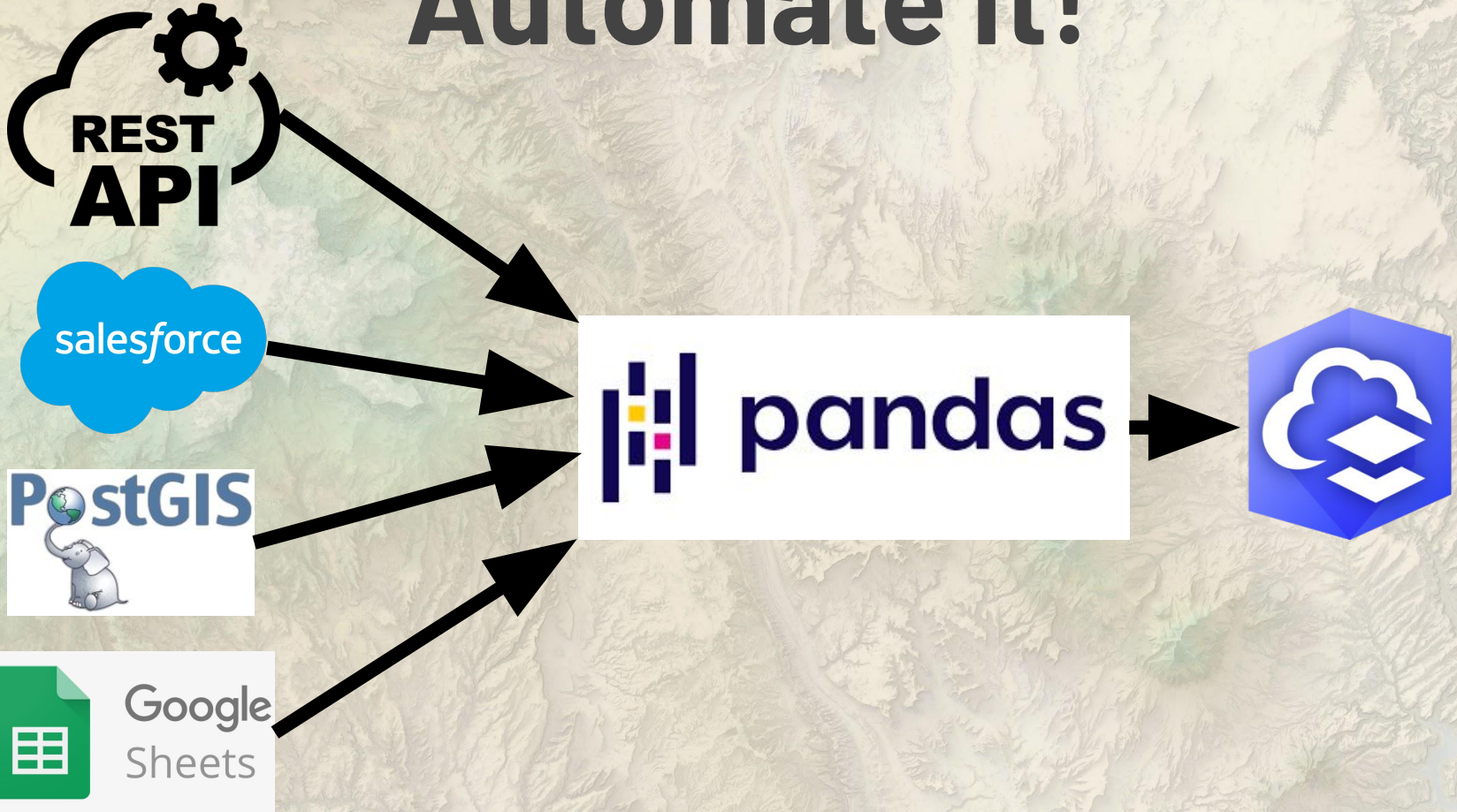
name	fips	pop_lastcensus	pop_currestimate	fips
SANPETE	39	28437	29724	490
IRON	21	57289	62429	490
KANE	25	7667	8227	490
WEBER	57	262223	269561	490
SAN JUAN	37	14518	14359	490



# WHAT GIVES PEOPLE FEELINGS OF POWER



# Automate it!





# The Process

1. **Extract your data into a DataFrame**
2. **Transform and clean your data according to your business needs**
3. **Save DataFrame to a feature class in a GDB**
4. **Add GDB as item to AGOL/Portal**
5. **`feature_layer.manager.truncate()` or `.delete_features()` to remove existing data if needed**
6. **`feature_layer.append()` to publish new data**

A topographic map of a mountainous region, likely the Grand Tetons in Wyoming, showing various peaks, valleys, and river networks. The map uses a color gradient from green (low elevation) to brown and tan (high elevation).

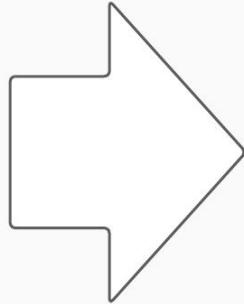
# Show Me

**Favorite Zelda Game Map:  
updating\_web\_layers.ipynb**



# palletjack: Making it Reusable

Re-inventing the Wheel  
Every Time



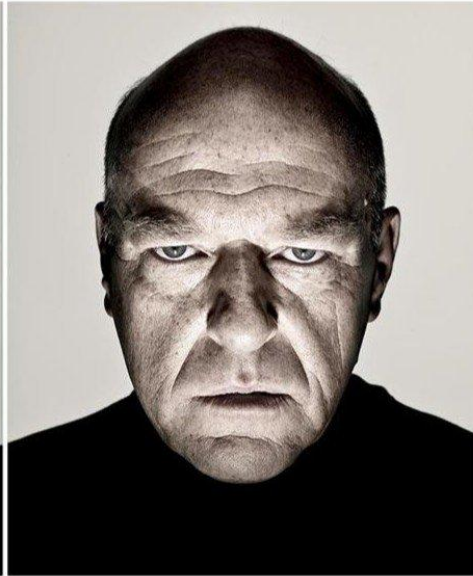
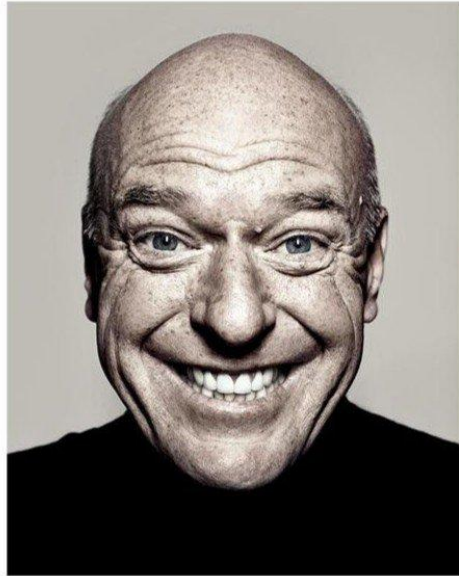
Using palletjack for  
Common Operations



# Cleaning and Transforming

"Yeah, I have the data for your map already in a spreadsheet!"

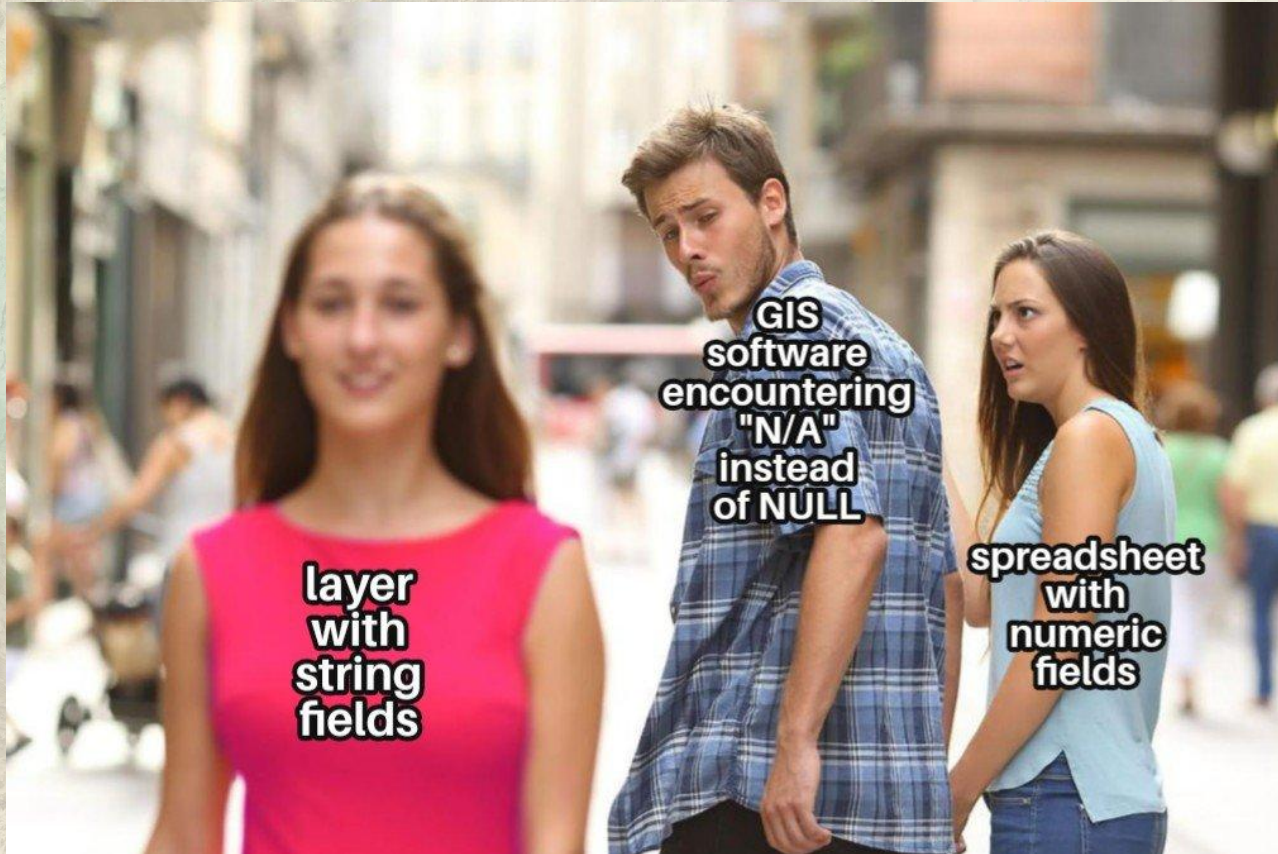
\*spreadsheet has 10 sheets with formulas, merged cells, and blank rows between data.\*



Credit: Kate Berg @pokateo\_



# Preparing Data for AGOL



Credit: Kate Berg @pokateo\_

# Data Checks

```
class FieldChecker:
    """Check the fields of a new dataframe against live data. Each method will raise errors if its checks fail.
    Provides the check_fields class method to run all the checks in one call with having to create an object.
    """

    @classmethod
    def check_fields(cls, live_data_properties, new_dataframe, fields, add_oid): ...

    def __init__(self, live_data_properties, new_dataframe): ...

    def check_live_and_new_field_types_match(self, fields): ...

    def _check_geometry_types(self): ...

    def check_for_non_null_fields(self, fields): ...

    def check_field_length(self, fields): ...

    def check_fields_present(self, fields, add_oid): ...

    def check_srs_wgs84(self): ...

    def check_nullable_ints_shapely(self): ...
```



# Data Fixes

```
class DataCleaning:
    """Static methods for cleaning dataframes prior to uploading to AGOL
    """

    @staticmethod
    def switch_to_nullable_int(dataframe, fields_that_should_be_ints): ...

    @staticmethod
    def switch_to_float(dataframe, fields_that_should_be_floats): ...

    @staticmethod
    def switch_series_to_numeric_dtype(series, dtype): ...

    @staticmethod
    def switch_to_datetime(dataframe, date_fields, **to_datetime_kwargs):
        """Convert specified fields to datetime dtypes to ensure proper date formatting for AGOL

        Args:
            dataframe (pd.DataFrame): The source dataframe
            date_fields (List[int]): The fields to convert to datetime
            **to_datetime_kwargs (keyword arguments, optional): Arguments to pass through to pd.to_datetime

        Returns:
            pd.DataFrame: The source dataframe with converted fields.
        """

        for field in date_fields:
            dataframe[field] = pd.to_datetime(dataframe[field], **to_datetime_kwargs) \
                .dt.as_unit('ns') \
                .dt.tz_localize(None)

        return dataframe
```

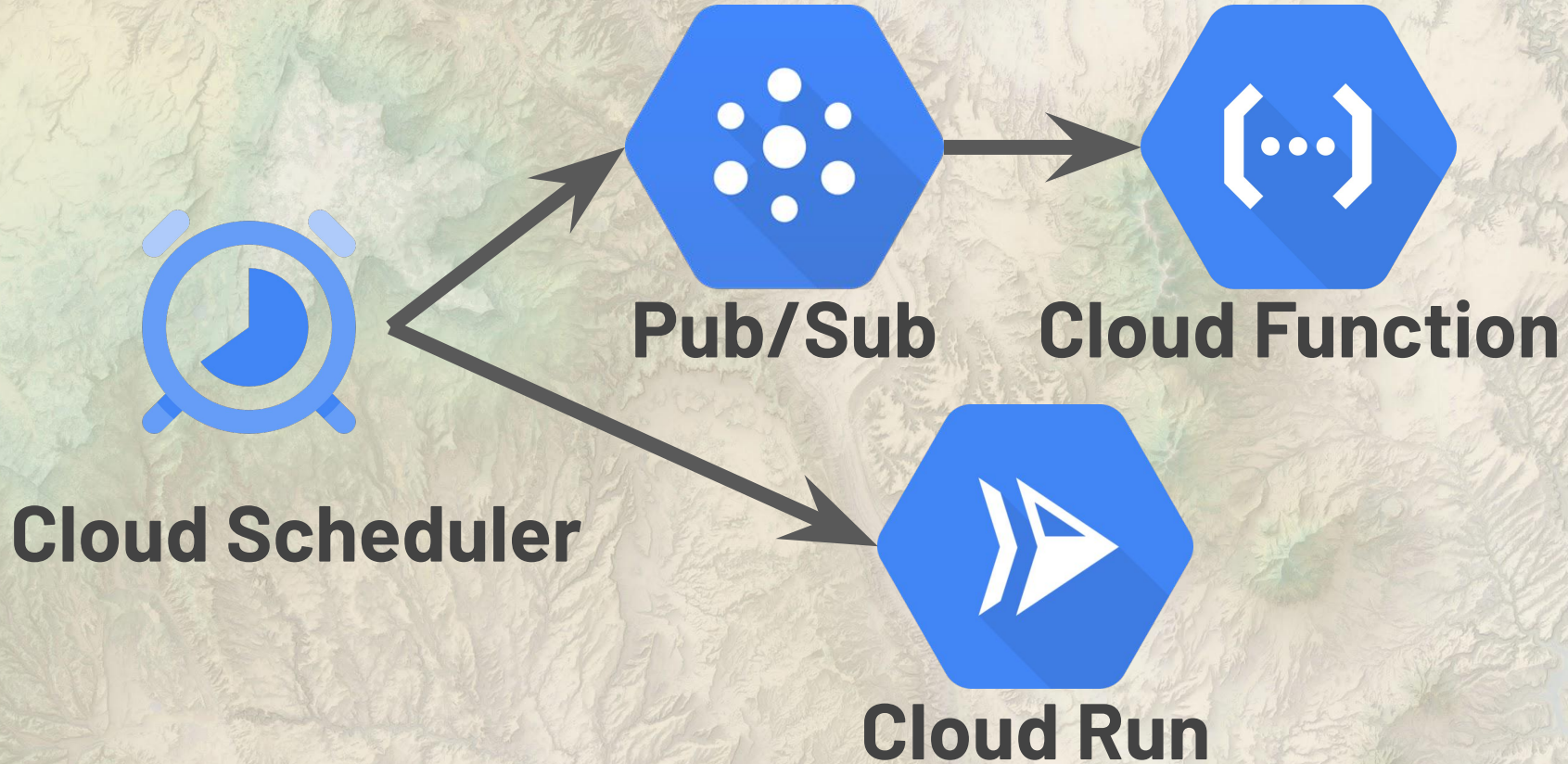
# Show Me part 2

A topographic map of a mountainous region, likely the Sierra Nevada mountains. The map uses a color gradient to represent elevation, with green and yellow for lower elevations and brown and tan for higher elevations. A prominent mountain range runs diagonally from the top left to the bottom right. A river system is visible, flowing from the upper right towards the lower left. The terrain is rugged with many peaks and valleys.

`palletjack_example.ipynb`



# Head in the Cloud(s)



# Ok, Show Me For Real

## Utah Recycling & Solid Waste Facility Map

[deq.utah.gov/waste-management-and-radiation-control/statewide-recycling-data-initiative](https://deq.utah.gov/waste-management-and-radiation-control/statewide-recycling-data-initiative)

[github.com/agrc/wmrc-skid](https://github.com/agrc/wmrc-skid)

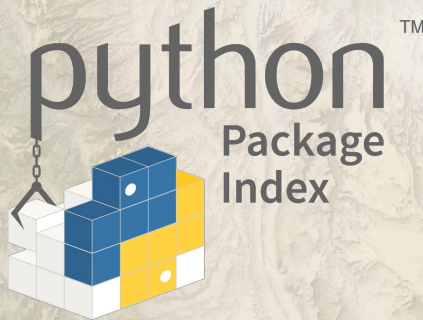
## Utah Flood Hazards Atlas

[experience.arcgis.com/experience/646356d3a2eb4db4bf6397edff54c09d/page/Utah's-Flood-Hazard-Layer](https://experience.arcgis.com/experience/646356d3a2eb4db4bf6397edff54c09d/page/Utah's-Flood-Hazard-Layer)

[github.com/agrc/nfhl-skid](https://github.com/agrc/nfhl-skid)



# palletjack in PyPI



<https://pypi.org/project/ugrc-palletjack>

```
C:\Users\jedadams  
(palletjack) λ pip install -U ugrc-palletjack
```

# Resources

**palletjack Code and readme:**

[github.com/agrc/palletjack](https://github.com/agrc/palletjack)

**palletjack Documentation:**

[agrc.github.io/palletjack/palletjack/](https://agrc.github.io/palletjack/palletjack/)

**Crib Code from Our Scripts:**

<https://github.com/search?q=org%3Aagrc+skid&type=repositories>





# UGRC

Utah Geospatial Resource Center

[jdadams@utah.gov](mailto:jdadams@utah.gov)

[gis.utah.gov/presentations](https://gis.utah.gov/presentations)

[github.com/agrc](https://github.com/agrc)