ABE 498: GRAIN PROPERTY DATABASE WEB APPLICATION

Presented by Jianxiang Tao

Background

What is physical property

- By definition:
  - Observed and measured without changing chemical identity of sample
- Some properties are:
  - Length
  - Density
  - Mass
  - Volume

Background

Physical property data is required for

- Selection and design of
  - Planting and harvesting
  - handling processing equipment
  - storage structures for cereal grains, co-products, and biomass
- Accurate modeling
  - DEM and FEM
  - Used more frequently now days in industry for equipment design and process optimization

Background/Objectives

Current sources → Do not contain usable property database

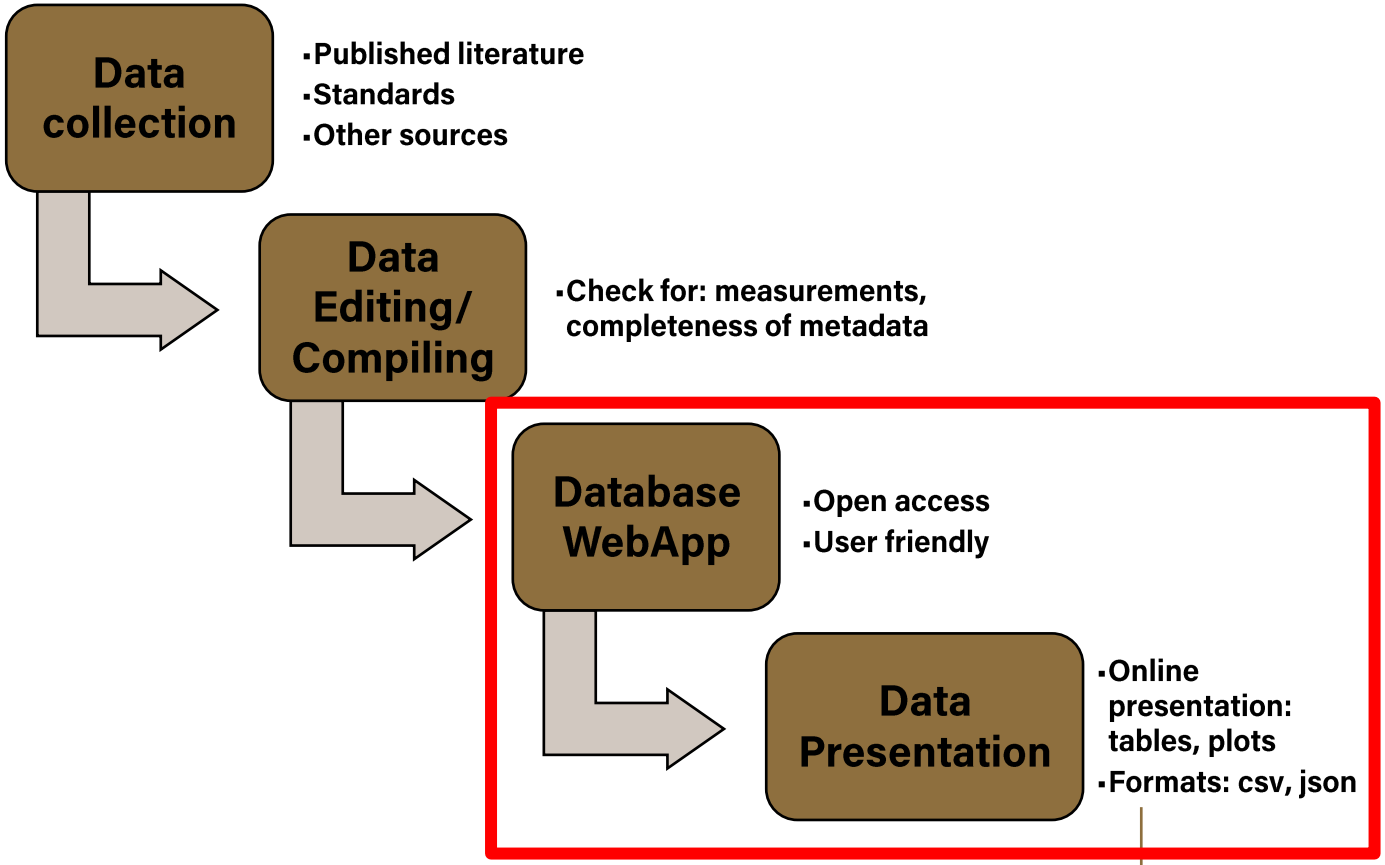
- ASABE has several reviews and paper collections on physical properties
- Two free access food properties database

Needs for searchable online database

- A free online database is critical for widespread adoption of property data
- A metadata associated with the property data
- An online database can present statistical information on material properties

Background/Objectives

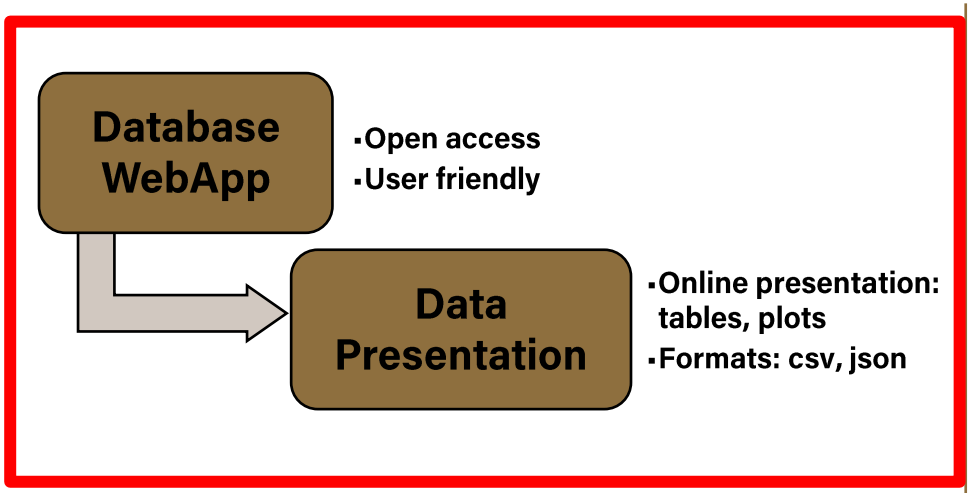
Components of the property database



Goal of the semester

Become familiar with:

- WebApp
  - Flask framework
  - HTML/CSS
  - JavaScript
- Database
  - Design RDBMS
  - SQL



Design

Components of Webapp

- Homepage
  - Shows the recent new data
- Database filter section
  - Shows the filtered result
- Individual data representation section
  - Numerical data table
  - Plots
  - Statistical data
- Section for uploading data

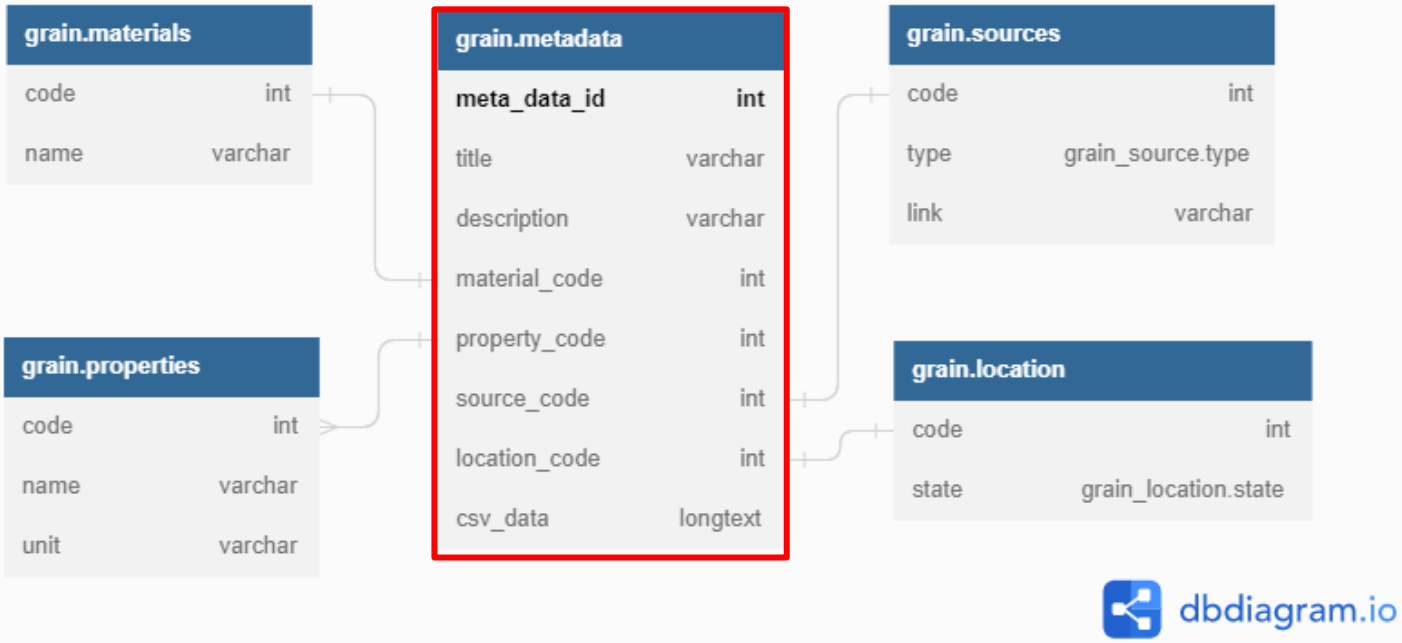
Design

What data to be included?

Metadata	Examples
Title	ABE 305 Group 5 Data
Description	Major and intermediate diameter …
Material*	Corn Soybeans Wheat
Properties	Size Density
Source/Link	Standards Published literature
Location	Country
	Region
Numerical Data	Data in csv format

Design

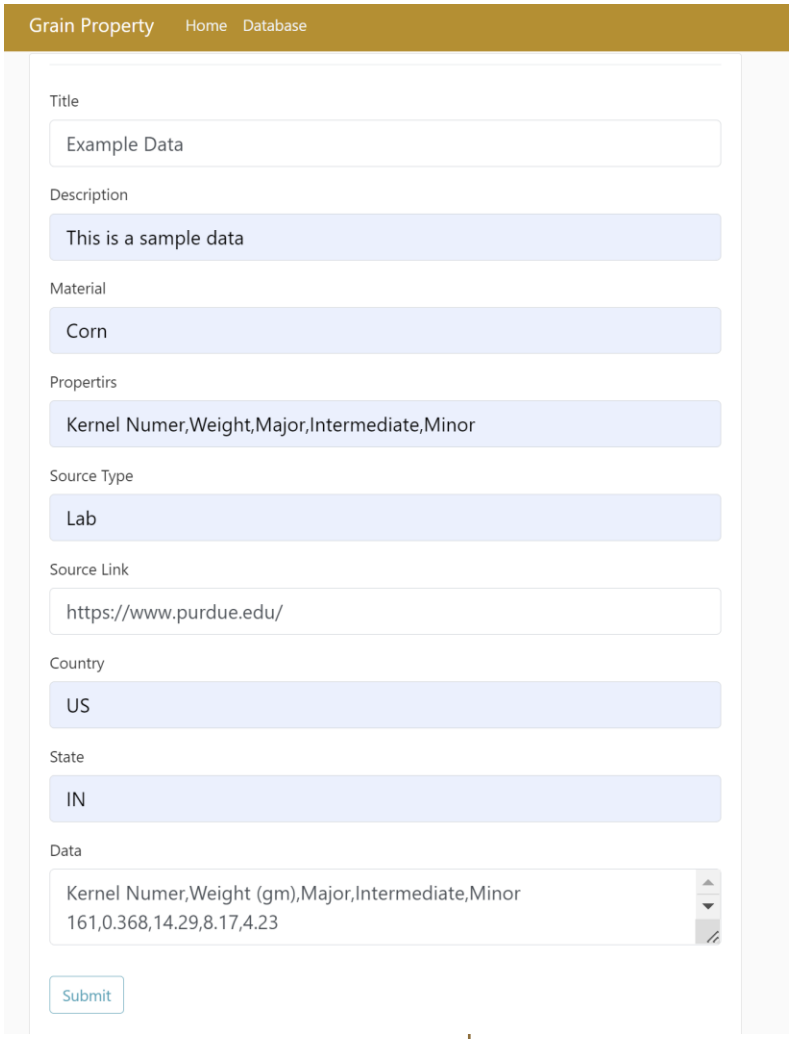
Database design: SQLAlchemy



Design

Data input form

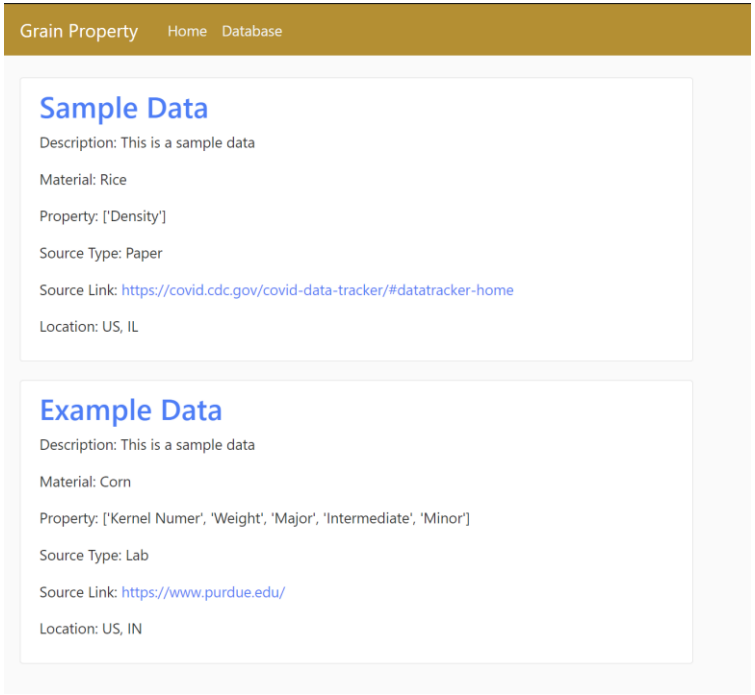
- Constrains
  - Specific format required:
  - Needs to be comma separated for “Properties”
  - Form validation only checks whether each form is filled or not
  - Data only accepts text format of csv



Design

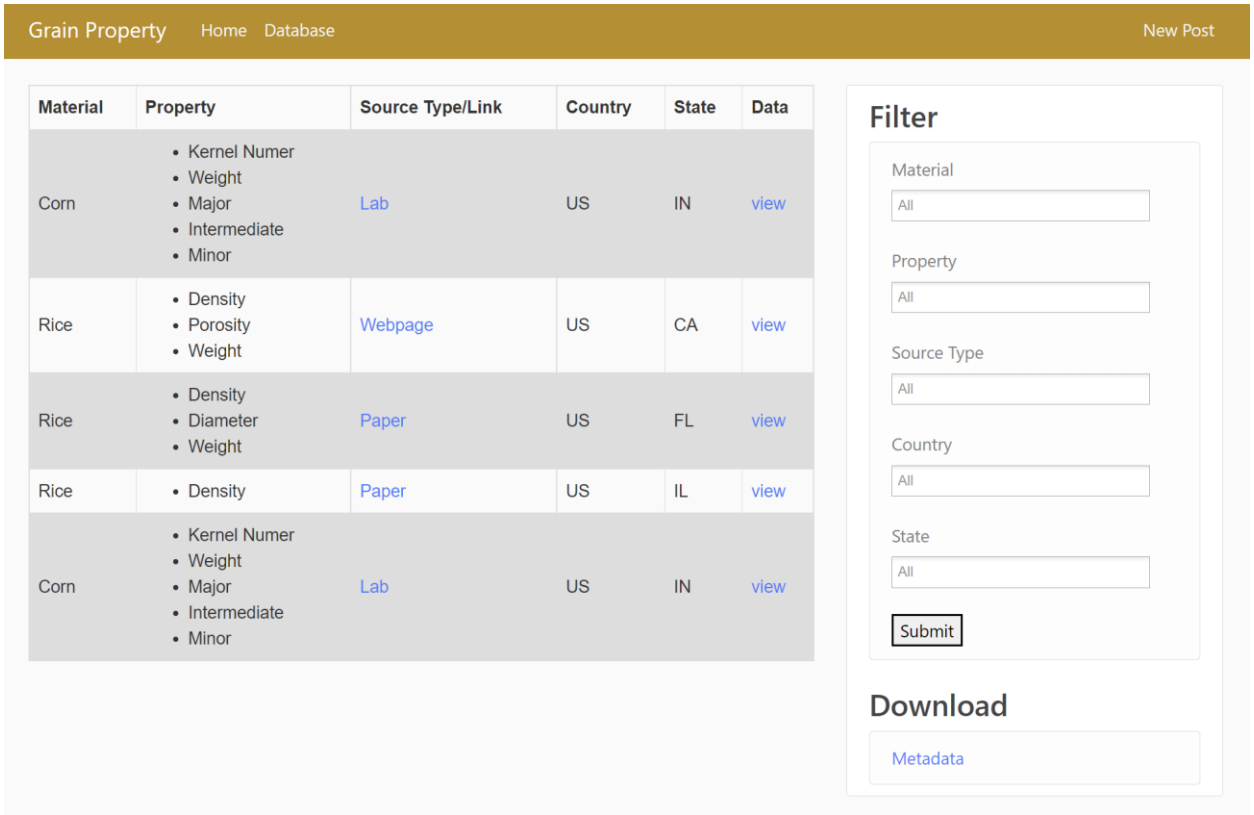
Homepage

- Constrains
  - User cannot control the time order of the post



Design

Searchable database

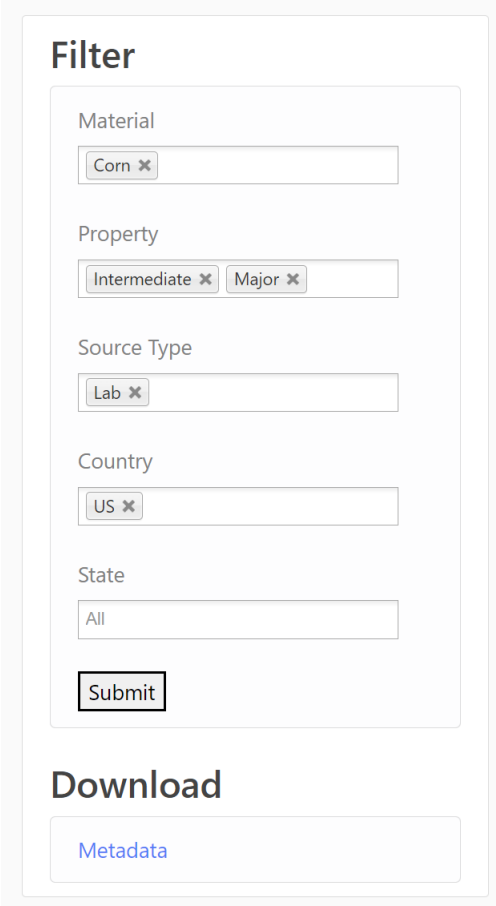


Design

Filter

- Constrains
  - Once “Submit” button is clicked, all the filter option will be rest. (Previously selected options are not memorized)

Download



Design

Data

Grain Property Home Database New Post

Kernel Numer	Weight (gm)	Major	Intermediate	Minor
161	0.368	14.29	8.17	4.23
162	0.330	12.48	8.29	4.83
163	0.273	12.41	7.45	3.70
164	0.375	13.58	7.51	4.87
165	0.214	10.12	5.23	5.74
101	0.413	13.75	8.91	4.48
102	0.285	12.09	6.40	4.97
103	0.390	14.19	7.94	4.34
104	0.401	13.98	8.09	4.85
105	0.277	11.39	7.83	4.41
166	0.290	13.60	7.24	4.25
167	0.353	13.98	7.52	4.01

Download

Data (CSV)

Metadata (JSON)

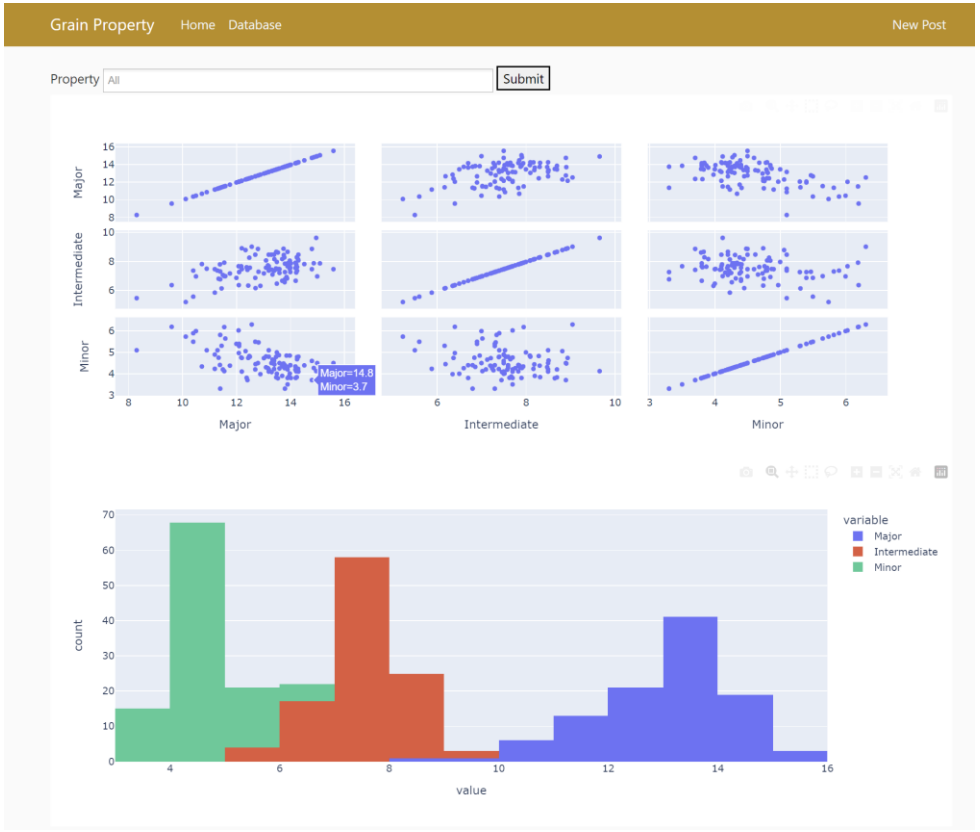
Other Tools

Data Vizualization

Statistics

Design

Visualization



- Constrains
  - Limited plotting type
  - Heavy to run
  - The plots and axes titles are compacted when there are 4+ variables

Design

Statistics

Grain Property Home Database New Post

	Kernel Numer	Weight (gm)	Major	Intermediate	Minor
count	105.00	105.00	105.00	105.00	105.00
mean	148.00	0.34	13.00	7.55	4.57
std	30.45	0.06	1.32	0.79	0.64
min	96.00	0.18	8.30	5.23	3.30
25%	122.00	0.29	12.18	7.13	4.19
50%	148.00	0.34	13.34	7.53	4.40
75%	174.00	0.38	13.90	7.95	4.85
max	200.00	0.51	15.60	9.66	6.31

Download

```
Kernel Numer,Weight (gm),Major,Intermediate,Minor
161,0.368,14.29,8.17,4.23
162,0.330,12.48,8.29,4.83
163,0.273,12.41,7.45,3.70
164,0.375,13.58,7.51,4.87
165,0.214,10.12,5.23,5.74
101,0.413,13.75,8.91,4.48
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104,0.401,13.98,8.09,4.85
105,0.277,11.39,7.83,4.41
166,0.290,13.60,7.24,4.25
```


```
[
  {
    "id": 5,
    "title": "Example Data",
    "Description": "This is a sample data",
    "Material": "Corn",
    "Property": ["Kernel Numer", "Weight", "Major", "Intermediate", "Minor"],
    "Source Type": "Lab",
    "Source Link": "https://www.purdue.edu/",
    "Country": "US",
    "State": "IN"
  }
]
```

Design

Design constrains

- Data input:
  - Only works well for raw data
  - Form for metadata is not well designed
- Filter bar:
  - Filter bar is reset every time

Technical constrains/concerns

- Slow data loading:
  - Structure/Code are not optimized
- Performance of database when more data is inputted

Next goal

- Re-design the data input form and what data to be stored
  - Gain more source and look at what data is presented
- Reduce the redundancy of the code/ Optimization
- Add some minor features for better user experience
  - Pagination, change order of display
- User testing for constructive feedback
- Deploy the webapp to see the performance
- Add user function (admin, experts, normal user)

THANK YOU

QUESTIONS?