Summer school 2025

Getting started with Orange

Tool for data mining and machine learning

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Visual programming

- Open-source tool for data mining
- Built on Python, but designed for non-programmers
- Create analysis workflows with drag-and-drop widgets
- Ideal for teaching, learning, and rapid prototyping
- Supports interactive data exploration and real-time results

Iris dataset

- One of the most famous datasets in data science and ML
- Contains measurements of 150 iris flowers, across 3 species
- Features:
  - Sepal length
  - Sepal width
  - Petal length
  - Petal width
- Goal: Classify species based on flower measurements
- Great for learning classification, visualization, and model evaluation

Example datasets

- **Iris**
  - Collected by Edgar Anderson and famously analyzed by R.A. Fisher in 1936.
  - Teaches basic classification, scatter plots, and model evaluation.
  - Ideal for understanding how machine learning separates classes.
- **Titanic**
  - Based on real passenger data from the 1912 shipwreck.
  - Teaches classification, missing data handling, and feature importance.
  - Great for illustrating real-world survival prediction.
- **Heart Disease**
  - From the Cleveland Heart Disease dataset at the UCI Machine Learning Repository.
  - Useful for binary classification and model comparison using medical data.
  - Good case for evaluating ROC curves and precision-recall.
- **Housing**
  - Originates from 1970s Boston housing data (U.S. Census and housing authorities).
  - Used for regression — predicting median home prices.
  - A practical introduction to numerical prediction models.
- **Zoo**
  - A synthetic dataset describing animals through binary traits.
  - Excellent for clustering, classification, and understanding decision trees.
  - Often used in education because of its simplicity and logic-based structure.
- **Brown Corpus**
  - A historic text dataset from the 1960s, one of the first balanced English corpora.
  - Used for text mining and topic modeling.
  - Demonstrates how to explore word frequency and document classification.

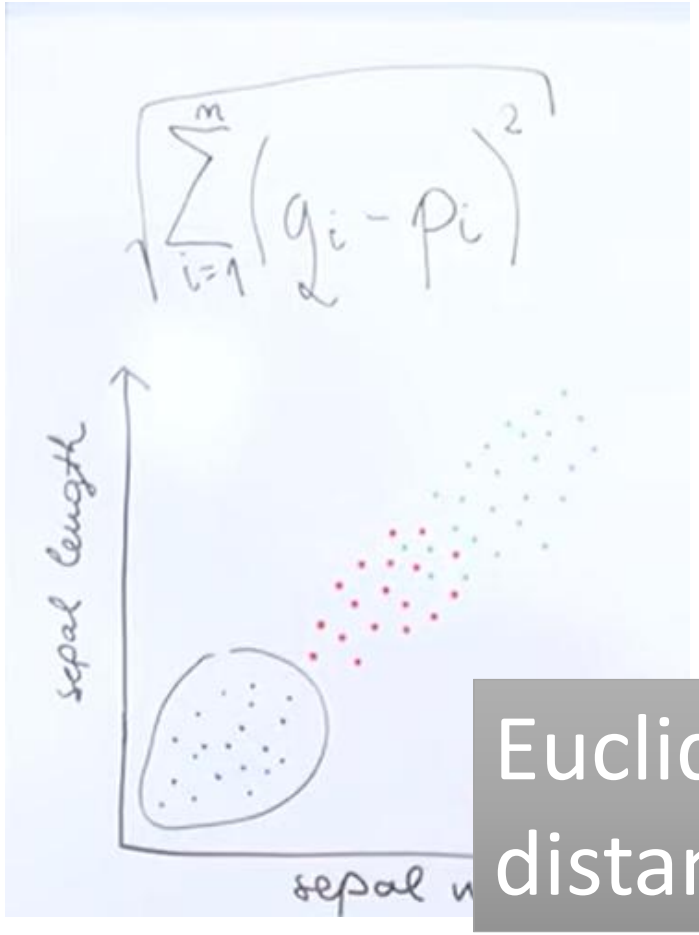
Data format

sepal length	sepal width	petal length	petal width	iris
c	c	c	c	d
				class
5.1	3.5	1.4	0.2	Iris-setosa
4.9	3.0	1.4	0.2	Iris-setosa
4.7	3.2	1.3	0.2	Iris-setosa
4.6	3.1	1.5	0.2	Iris-setosa
5.0	3.6	1.4	0.2	Iris-setosa
5.4	3.9	1.7	0.4	Iris-setosa
4.6	3.4	1.4	0.3	Iris-setosa
5.0	3.4	1.5	0.2	Iris-setosa
4.4	2.9	1.4	0.2	Iris-setosa
4.9	3.1	1.5	0.1	Iris-setosa

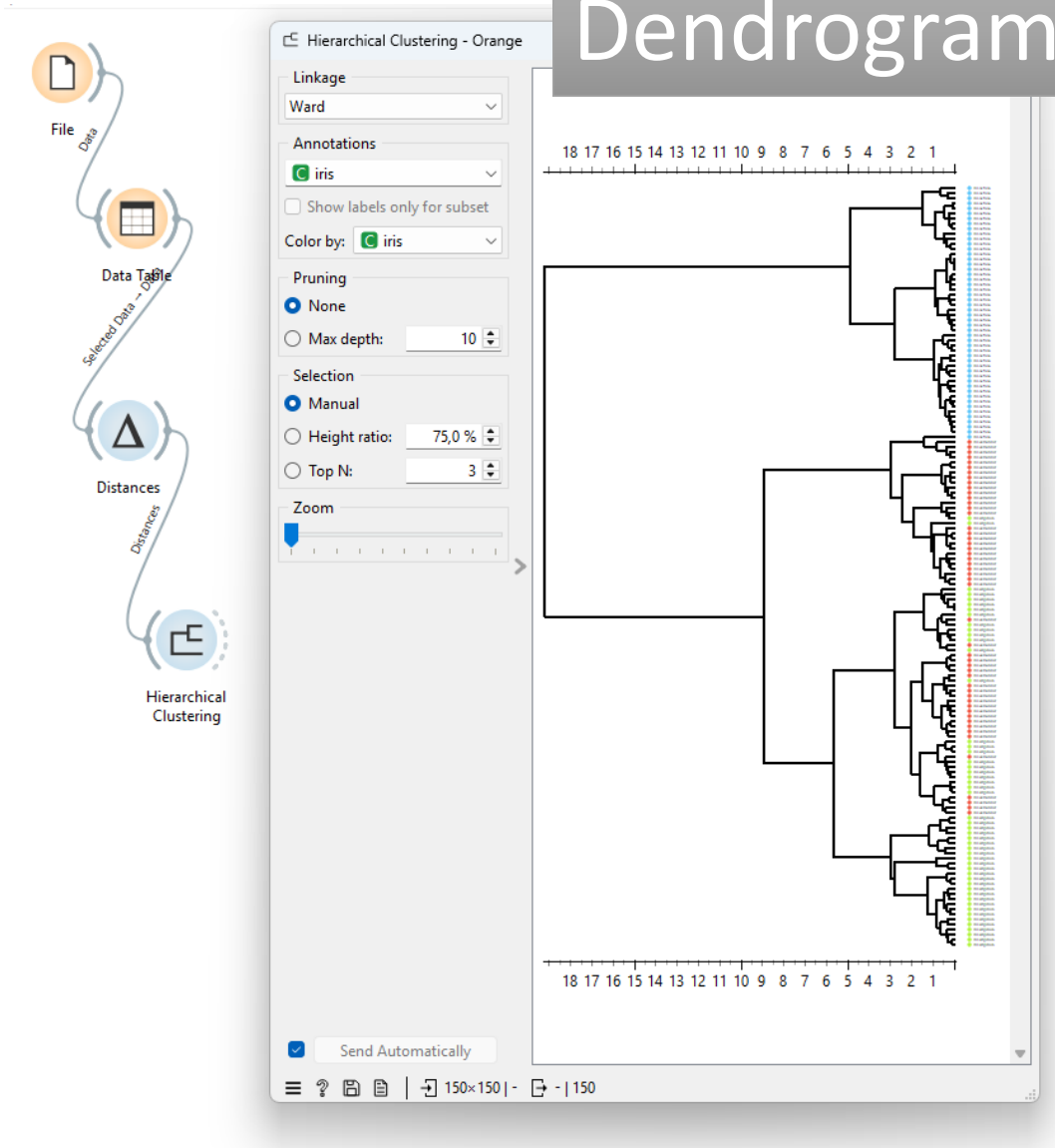
- Tab-delimited text file with three header rows:
  - attribute names
  - type (continuous, discrete or string)
  - class, meta, time

Building a simple data workflow in Orange

Hierarchical clustering



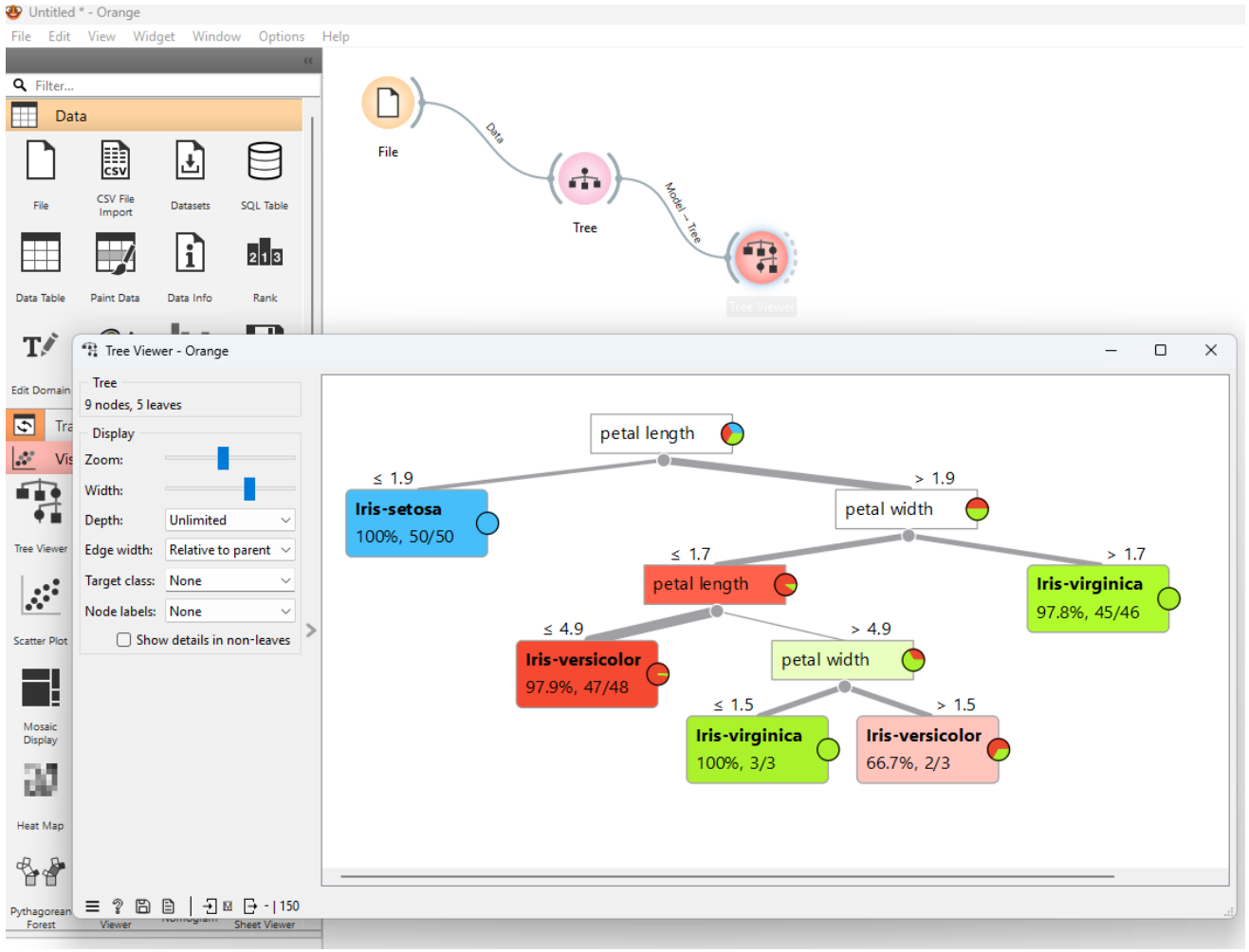
Euclidian distances



Use hierarchical clustering to explore patterns in a dataset of your choice

- **Load a Dataset**
  - Load one of the datasets:
  - – iris.tab
  - – zoo.tab
  - – heart_disease.tab
- **Create a workflow**
  - Connect widgets in this order:
  - File → Distance Matrix → Hierarchical Clustering → Data Table
  - Optionally add Scatter Plot or Box Plot to visualize clusters
- **Try these tasks:**
  - How many clusters make sense based on the dendrogram?
  - Which features seem to drive the clustering the most?
  - Can you identify any clear groups or outliers?
  - Compare results when changing the distance metric (Euclidean, Manhattan, etc.)

Classification models



Train and evaluate different machine learning models

- Load a dataset (e.g., iris.tab, titanic.tab, or zoo.tab)
- Add the following learners and connect them:
  - Logistic Regression
  - Random Forest
  - k-Nearest Neighbors
  - Naive Bayes
- Connect all models to Test & Score to evaluate them.
- Which model performs best?
- How does model performance change if you remove a feature?

Ready to explore real data?

- Now it's your turn!
- Load the dataset (Dob_breeds.csv) into Orange and try out:
- Data Table – Explore the samples
- Classification – Use Logistic Regression, Random Forest…
- Test & Score – Evaluate accuracy
- Confusion Matrix – See which breeds are tricky to distinguish