



## Smart Irrigation: Big Data approach for accurate water stress detection and precision irrigation in fruit crops

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### Challenge:

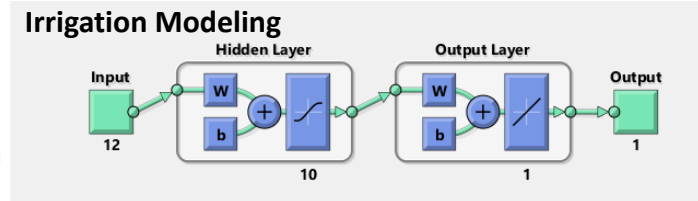
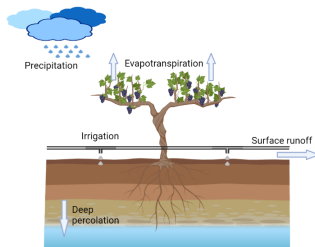
- Under and over irrigation of fruit crops (e.g. wine grapes) are both non-ideal for overall productivity and quality
- Current irrigation strategies lack the capability to control soil moisture at desired level
  - Destructive sampling is labor intensive and costly
  - Essential to develop plant water stress assessment using ground-based non-contact sensors



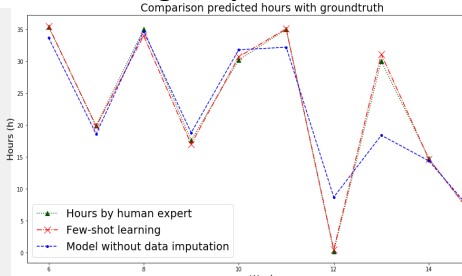
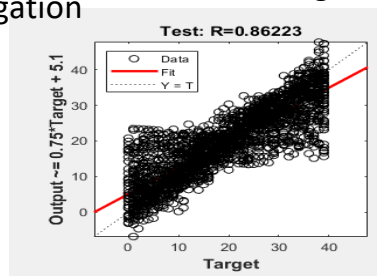
Data Collection

### Solutions:

- Ground based hyperspectral imaging system
- Machine learning models to estimate water stress using spectral data
- Incorporation of temporal-spatial features with Graph Neural Networks (GNN) and learning of graph representation
- Machine learning models to predict irrigation requirements



### Irrigation Scheduling Outputs



### Scientific Impact:

- Within-vine spatial analysis of water stress in 3D canopy space
- Classification of water stress into practically important categories
- A knowledge graph for data analytics over multi-dimensional factors, including soil moisture, leaf water potential, and weather conditions
- Accurate irrigation experiments (e.g. Deficit Irrigation) through precise control of soil moisture content

### Broader Impact:

- Faster and easier data acquisition system that can be used in wider precision ag applications
- Irrigation water estimation tool applicable to other fruit crops
- Three female graduate students involved, one graduated
- Information disseminated through conferences and journal papers