



Task 4.3.3 Relatech

Advanced Tools based on data-driven approaches for managing the risk associated with CC

Unit leader: Domenico Saccà, Eugenio Veltri

► **Target:**

- Evaluate impact of extreme weather events on agricultural yield

► **RICA Dataset**

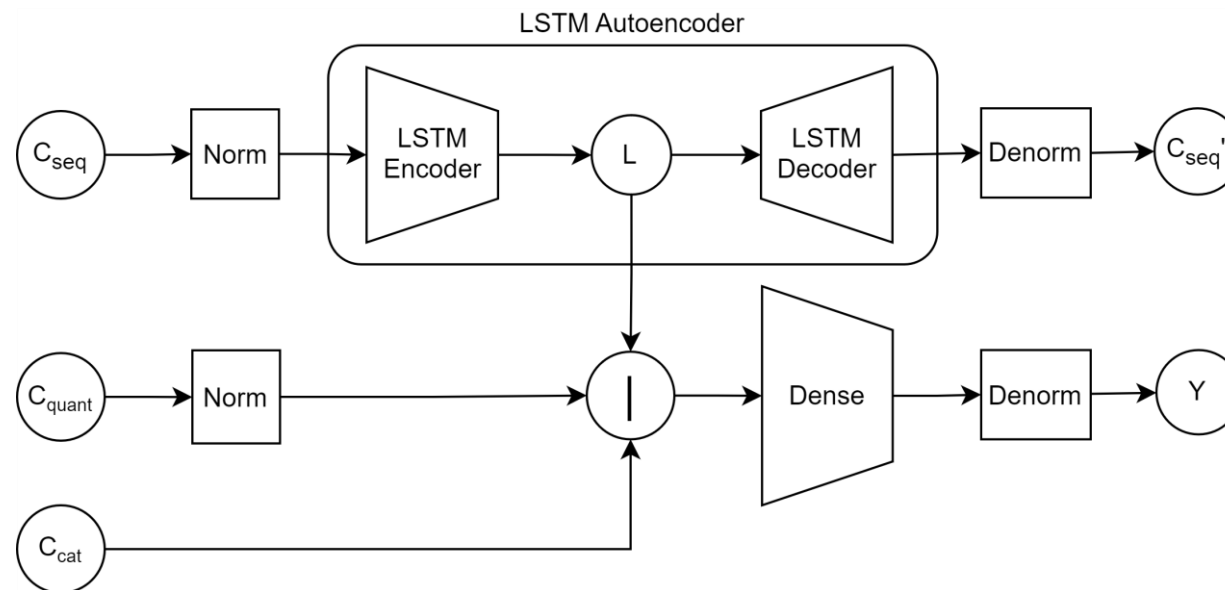
- Daily weather time series for each cultivation period
- Yield and cultivation features of many agricultural factories in Italy

► **Proposed Technique:**

- Define an AI model for predicting an yield index, based on modelling meteorologic multivariate time series for discovering extreme events

► **Activity steps:**

- **Preprocessing:** building of weather time series, data cleaning
- **Training** of regressor and autoencoder
- **Residuals** study and visualization





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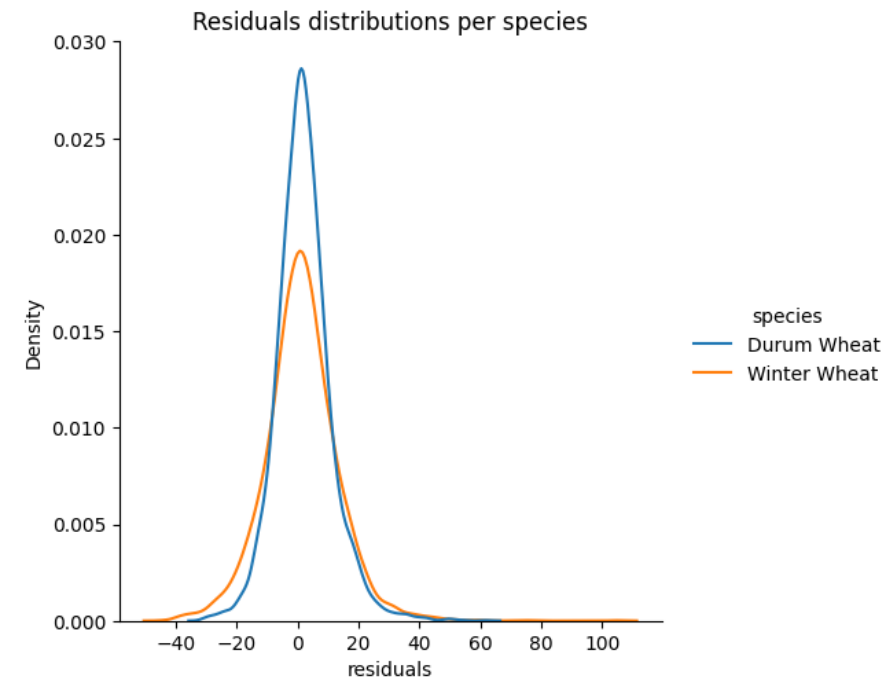
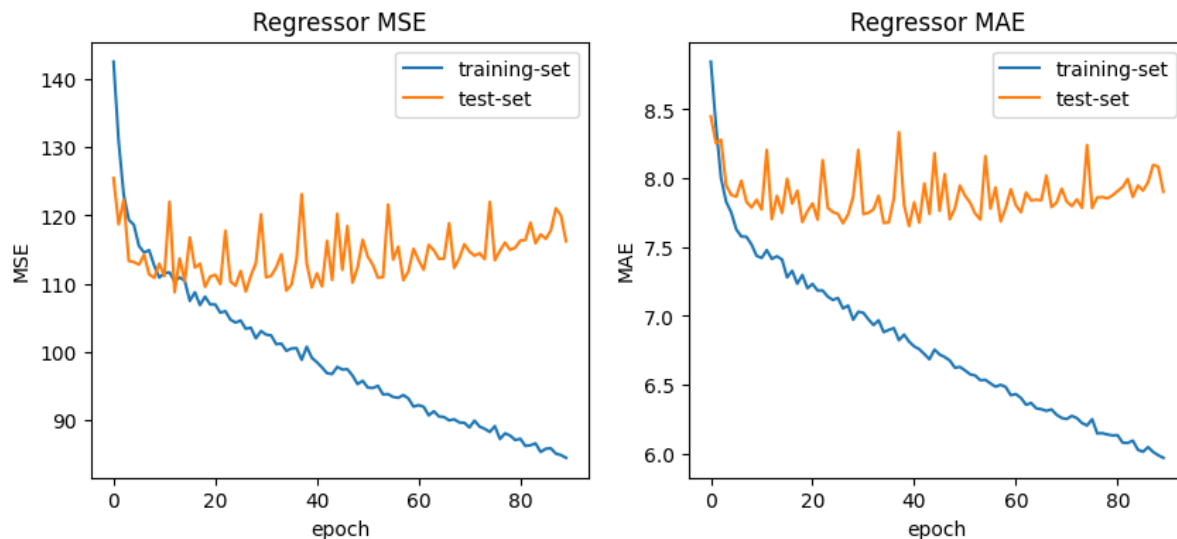
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- ▶ **Loss:** SmoothL1
- ▶ **Residuals:** Mean = 0, low variance
- ▶ **Metrics:** Low MSE and MAE
- ▶ **Future Work:**
 - ▶ Test new and more complex architectures
 - ▶ Try better data cleaning criteria

$$L_{smooth}(c_i, \hat{c}_i) = \sum_{j \in \{x, y, w, h\}} smooth_{L_1}(c_{ij} - \hat{c}_{ij})$$

$$smooth_{L_1}(x) = \begin{cases} 0.5x^2 & |x| < 1 \\ |x| - 0.5 & o.w. \end{cases}$$



► **Input: C_quant, quantitative variables:**

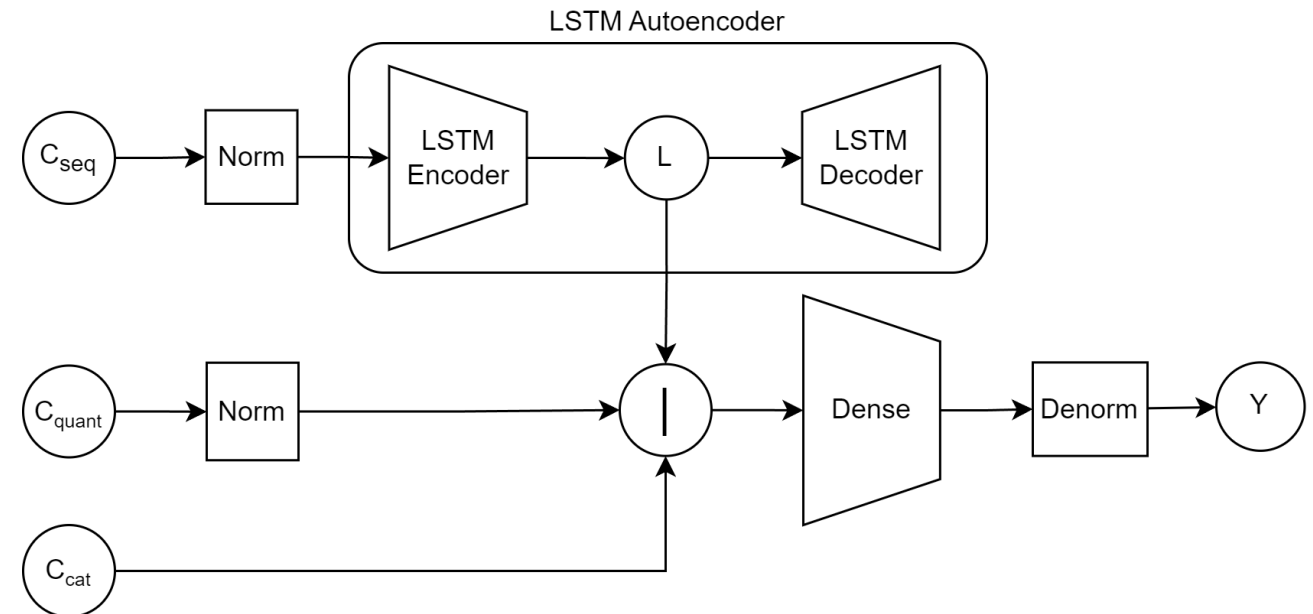
- SUPERFICIE_UTIL: cultivated area
- SUP_IRR_TA: irrigated area
- Ore_Uomo : number of hours worked by personnel
- Ore_Macchina : number of hours worked by machines
- Concimi: fertilizer costs
- Energy: energy costs
- Volume_Totale_Acqua: total water volume di acqua per total area
- Volume_Acqua_Ha: water volume per ectar
- GG_Medie_Irrigazione: number of irrigation days

► **Input: C_cat, categorical variables:**

- ID_SPECIE_VEG: plant species
- SUCC: specifies if the crop succeeds another in the same year, on the same land
- CONS: specifies if there is a crop associated with the current one

► **Input: C_seq, weather sequences:**

- Daily sequences of weather variables in crop period
- Examples of crop periods:
 - October-June for wheat
 - March-October for vine



Output, yield index

$$Y = \frac{yield}{cultivated\ area}$$