D2.3 Automated demonstrator of EEDA rules for causal discovery **(M21)**
D2.4 Reproducible demonstrator of EEDA AI rules for causal discovery **(M21)**
D2.5 Visualization demonstrator of EEDA for causal discovery **(M21)**
D2.6 Demonstrator all parts for the sustainability of the Oceans' **(M24)**

Work package number	**3**	**Lead beneficiary**	**TU GRAZ**		
Work package title	**Discovery in federated networks**				
Participant number	9	6	5	8	3
Short name of participant	SRC	TU GRAZ	EPFL	URV	SCITE
Person month per participant	24	24	12	12	11
Start month	13				
End month	36				

Objectives

- To develop an evolutionary-diversification inspired framework for discovery in federated networks.
- To derive diversification rules required for computation discovery in federated networks.
- To apply rules to discover novel paths for Oceans' sustainability.

Description of work

Task T3.1: Extend EEDA for discovery in federated networks (M13-M36) *Leader: **SRC**. Contributors: 9*

This task extends EEDA in T2.1 for general principles of discovery in federated networks. T3.1 provides process-based models with diversifying traits and interactions along node heterogeneity gradients. Federated networks are represented as interacting species, human groups and technologies containing heterogeneity gradients and multidimensional properties. Mean field deterministic models will be developed and contrasted to the stochastic counterparts (T3.2). These features will allow WP3 to implement diversification rules when heterogeneous groups interact and share resources in ecosystems. Extensions of EEDA solutions are required to discover novel diversification rates in species, technologies and human strategies that improve sustainability paths in comparison to the observed empirical patterns in our case study.

Task T3.2: Develop ENDI in federated networks (M13-M36) *Leader: **TU GRAZ**. Contributors: 6*

T3.2 provides computation algorithms for neural diversification-inspired processes to allow WP3 to implement this feature for discovery in federated networks. Neurons will be represented as algorithms along heterogeneity and/or complexity gradients. Links represent cooperation, learning or competition. A federated neural network is composed by types of neurons: Species, human groups and technology all containing heterogeneity along many dimensional traits. The goal is to discover new rules representing high sustainability values defined broadly as a high degree of coexistence among many species, diversified technologies and human groups. The dynamics of interacting neurons will be essentially stochastic. The following are the rules governing the dynamics: we start with a population of algorithms extended in a landscape and fitness functions determine birth and deaths of algorithms. We will consider stochastic spiking neurons within nodes to compute how information processing evolves in the network. We will consider a variety of scenarios from strong selection to neutral federated networks to explore sustainability paths. Which scenario provides higher sustainability-efficiency information processing in federated networks? T3.2 and T3.1 will interact to strengthen deterministic and stochastic solutions for EEDA and ENDI implementations in federated networks.

Task T3.3: Based on the framework developed in T3.1 and T3.2, URV will derive automation rules for knowledge discovery (M25-M36) *Leader: **URV**. Contributors: 8*

URV will complement T3.1 and T3.2 to obtain the scenarios of ENDI that represent the knowledge discovery paths for sustainability trajectories not observed in the empirical patterns of the sustainability of the Oceans case study. URV will work together with T3.1 and T3.2 to automate and discover expressions and rules generated by ENDI.

Task T3.4: Reproducible discovery knowledge graphs (M25-M36) *Leader: **EPFL**. Contributors: 5*

In this task the EPFL will integrate the work done in T3.1 and T3.2 into reproducible and replicable discovery knowledge graphs. T3.4 samples the discovery paths to obtain the robustness of these roads to sustainability. Robustness will be analyzed working closely to the URV partner in T3.3.