

## Advanced Project (Option B):

### **Classifying EU Sustainability Performance**

If you choose this challenge, you will work with data from the [2025 Europe Sustainable Development Report](#) - the definitive assessment of how EU nations are progressing toward the UN's Sustainable Development Goals (SDGs). This dataset captures the sustainability performance of 49 European countries across a decade (2015-2024), tracking everything from renewable energy adoption to innovation spending, governance quality to social equity.

Your machine learning models will classify nations into performance tiers - identifying which countries are "Sustainability Leaders," which are "Good Performers," and which "Need Improvement."

With Europe's Green Deal and €750 billion recovery fund focused on sustainable transformation, your analysis could reveal which policy levers actually drive change. This is machine learning applied to one of humanity's greatest challenges - using AI to accelerate progress toward a sustainable future.

#### **Goal:**

Classify European countries into sustainability performance tiers and identify improvement pathways

#### **Data Source:**

- For the purpose of the Thrive project, you will work with a **pre-prepared dataset** available [here](#).

*Note: The full dataset contains 100+ indicators across all 17 SDGs for European countries. We've pre-selected key features for this classification task, but feel free to explore the complete dataset and research report for additional insights!*

- **Original Data Source:** Europe Sustainable Development Report 2025
- **Full Dataset & Report :** <https://eu-dashboards.sdgindex.org/>
- **Research Paper:** Lafortune, Guillaume and Grayson Fuller (2025). Europe Sustainable Development Report 2025: SDG Priorities for the New EU Leadership. Paris: SDSN and Dublin: Dublin University Press.

## Part 1: Data Exploration & Understanding

### Tasks:

1. **Load the prepared dataset (see** (eu\_sdg\_performance\_data.csv)
2. **Explore the target variable:** Understand the 3 performance tiers
3. **Analyze the features:** Examine key policy indicators
4. **Visualize patterns:** Compare tiers and identify differences

### Key Questions:

- How many countries and observations do we have for each performance tier?
- What distinguishes "Sustainability Leaders" from "Needs Improvement" countries?
- Which features show the strongest correlations with performance tiers?
- Are there clear patterns separating the three performance levels?

### Expected Dataset Structure:

- ~490 observations (49 countries × 10 years)
- Target: performance\_tier (0: Needs Improvement, 1: Good Performers, 2: Leaders)
- 15 features across Economy, Innovation, Governance, Education, Environment, Social domains

## Part 2: Model Training & Evaluation (4 hours)

### Tasks:

1. **Data preparation:** Handle any preprocessing needs, create train/test splits, separate the target variable (sdgi\_score and performance\_tier)
2. **Train at least 2 models:** e.g. Logistic Regression, Random Forest
3. **Compare performance:** Evaluate accuracy, precision, recall for each tier
4. **Feature importance analysis:** Identify which policy areas matter most

### Key Questions:

- Which model performs best for multi-class classification?
- What are the top 5 predictive features for sustainability performance?
- Which tiers are most often confused with each other?
- How confident can we be in our tier predictions?

### Performance Expectations:

- Target accuracy: >75% (with 490 observations)
- Balanced performance across all 3 tiers
- Clear feature importance rankings

## Part 3: Policy Insights & Use Case Documentation (2 hours)

### Focus:

1. **Tier characterization:** Define clear profiles for each performance level
2. **Policy recommendations:** Identify pathways for countries to advance tiers
3. **Country-specific insights:** Analyze improvement opportunities for underperformers
4. **Use case documentation:** Complete appliedAI template with business impact

## Tasks:

1. **Reflect on your findings** in this project using the [appliedAI Use Case Platform template](#).

### Minimal Required Sections:

- **Title:** "EU Sustainability Performance Tier Classification"
  - **Industry:**
  - **Brief description:**
  - **Value gain:**
  - **AI capabilities:**
  - **Data sources**
  - **Expected business impact:**
2. **Take screenshots** of your completed Use Case template on the platform and add these to a dedicated folder `"/use_case_documentation/"` in your GitHub
  3. **Write up** a brief list of actionable policy recommendations for EU decision-makers, saving these as a PDF or Markdown file in a dedicated folder `"/policy_analysis/"`. For example, you may consider including
    - A bulleted list of **tier profiles**: "Leaders typically have R&D >X%, governance >Y, renewables >Z%"
    - A brief **advancement roadmap**: "To move from Tier 1→2, focus on [top 3 improvement areas]"

## Part 4: Check your work and submit

- Check your work against the success criteria:
  - ✓ Multi-class classification accuracy >75%
  - ✓ Clear identification of top 5 predictive factors
  - ✓ Specific advancement pathways for each tier
  - ✓ Complete use case documentation with quantified business impact
  - ✓ Actionable policy recommendations for EU decision-makers
  - ✓ Professional GitHub repository with organized documentation structure
  
- Prepare your submission in a .doc or .pdf document which includes:
  - Your full name
  - The email you use for Kiron's Thrive program
  - A working link to your Jupyter notebook with complete multi-class classification analysis, via your GitHub repository, which should also include:
    - i. **Screenshots of your use case** template on the appliedAI Use Case Platform should be included via a dedicated GitHub folder called `"/use_case_documentation/"`
    - ii. **A brief policy insights report** (PDF/Markdown), complete with tier profiles and advancement roadmaps, should be included via a dedicated GitHub folder called `/policy_analysis/`
  
- Upload your .doc or .pdf document to the 360L platform (final step in AAI-9 course) **by midnight on 21st September**. (Please contact us at [thrive@kiron.ngo](mailto:thrive@kiron.ngo) if you require a one- or two-week extension).