Innovations of Regional Sustainability: European University Alliance

A European University Alliance

invest

The Competitive University for a Sustainable Society

Co-funded by the Erasmus+ Programme of the European Union

Training on Trainers event, Skiathos, Greece 2022

1. Introduction to EDUC8EU

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EDUC8EU ToT overview

9:30 - 9:45: 1. A high-level introduction to the EDUC8EU framework

9:45 - 10:30: 2. Presentation of EDUC8EU software

10:50 - 11:35: 3. Hands-on practical exercises to explore simple get-to-know exercises

11:35 - 12:10: 4. Hands-on practical exercises to explore real-life scenarios

12:10 – 12:30: 5. Q&A time

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A high-level introduction to the EDUC8EU framework

About the presenter

- PhD in Computer Science from the School of Science & Technology, Hellenic Open University (Greece)
  - Assistant professor at the department of Digital Systems of the University of Thessaly, Greece
- Research interests: Modeling of educational processes, Software engineering, Semantic web technologies, Learning analytics, Machine learning
- INVEST Engagement:
  - Developer of EDUC8EU software integrated platform
  - Coordinator of the RES-Q (RESCUE) Living Lab

Omiros Iatrellis

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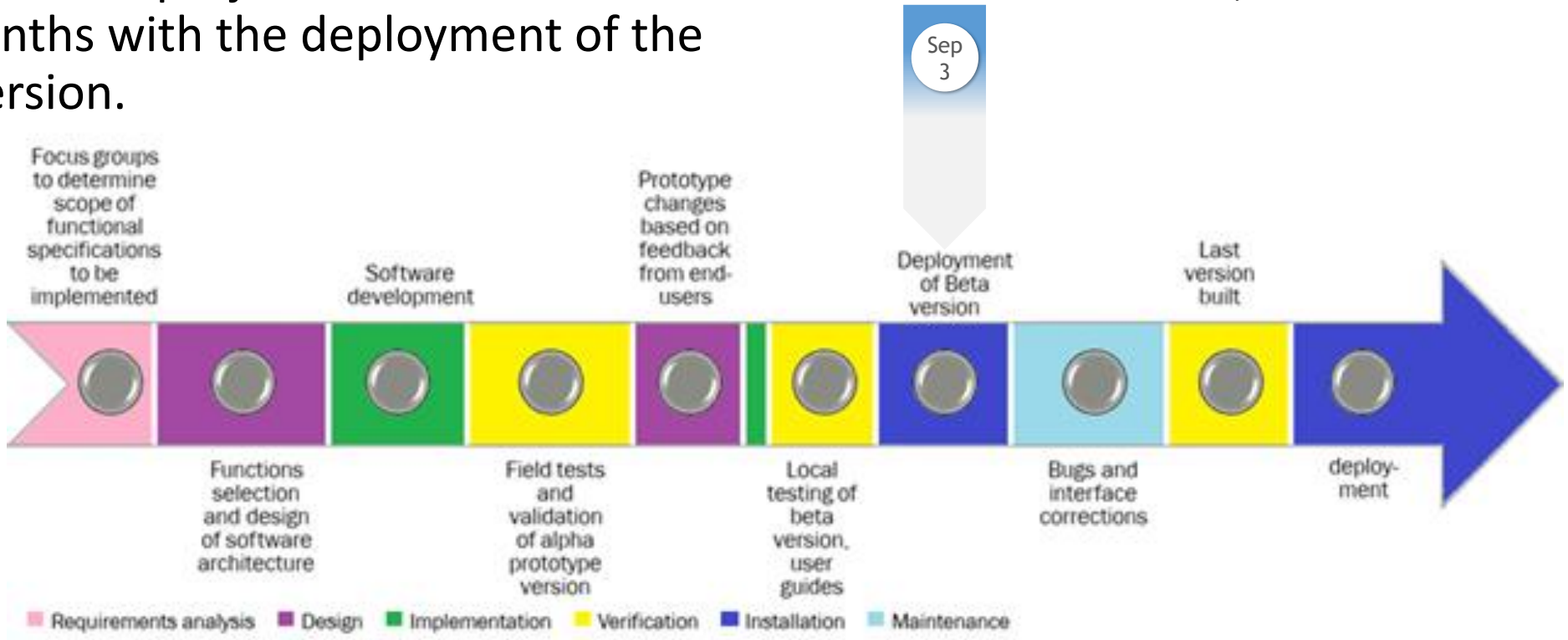
Software development processes

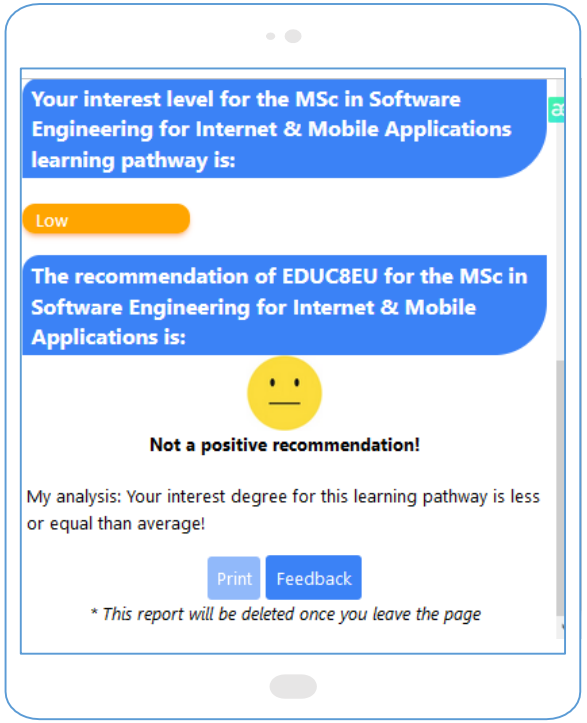
- The EDUC8EU project culminated in the last months with the deployment of the beta-version.



The timeline for the development phases

Motivation

- Students attending Higher Education Institutions (HEIs) are faced with a variety of complex decisions and procedures.
- To provide students with more sustained and personalized advising a software solution is needed
- EDUC8EU will **provide support and guidance to students at key decision points** or exceptional situations that require appropriate modifications/reconfigurations of the academic plans of a student, thus increasing the flexibility of the learning processes



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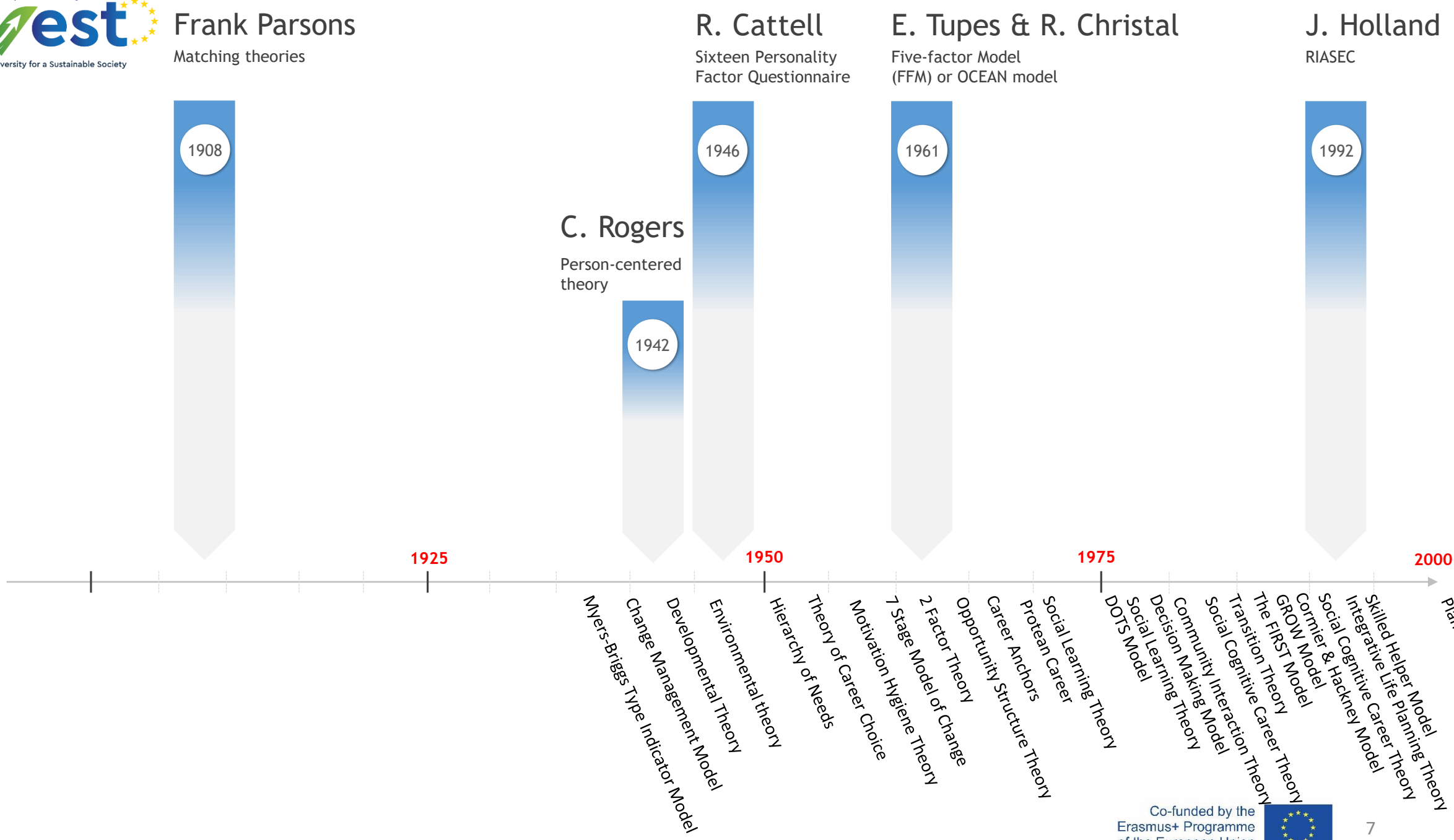

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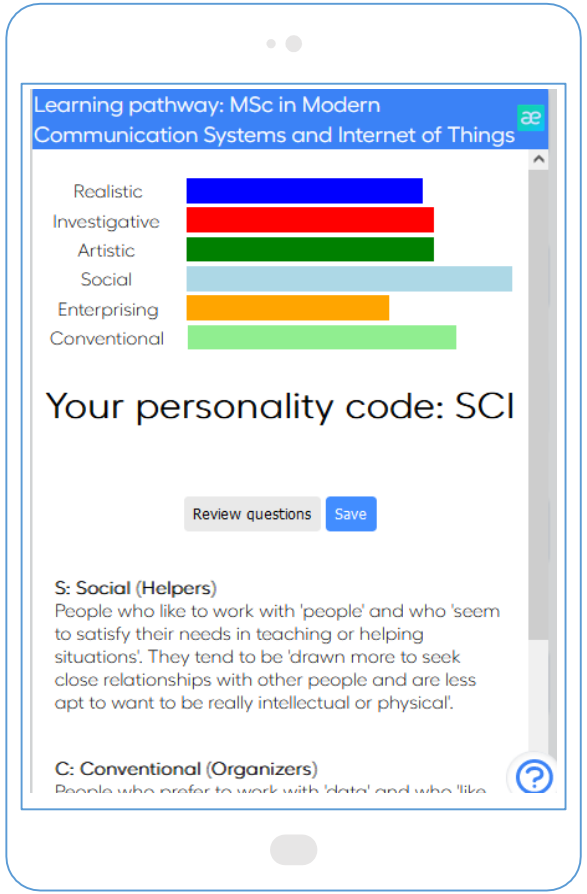
EDUC8EU compared to other approaches

- EDUC8EU adopts **Hollland's theory (RIASEC)**, but does not rely solely on it to produce the recommendations.
  - The backbone of the engine is the **AI-based system** that mimics human expertise in the academic advising field.
- EDUC8EU provides a more **holistic approach**
- **Multi-criteria matching** of recommendations to learner's parameters
- **Detailed and comprehensive analysis** that is displayed as the final output to the student



Which factors are included in the EDUC8EU learner model?

- Student's personality
- Student's interest degree
- Academic advisors' knowledge and experience
- Requirements (skills, knowledge etc.) derived from analyzing ESCO, O*net and ILO profiles
- Program prerequisites

→

EDUC8EU

#AI
#FuzzyLogic
#PersonalityMatching
#SemanticWeb

→

RECOMMENDATION

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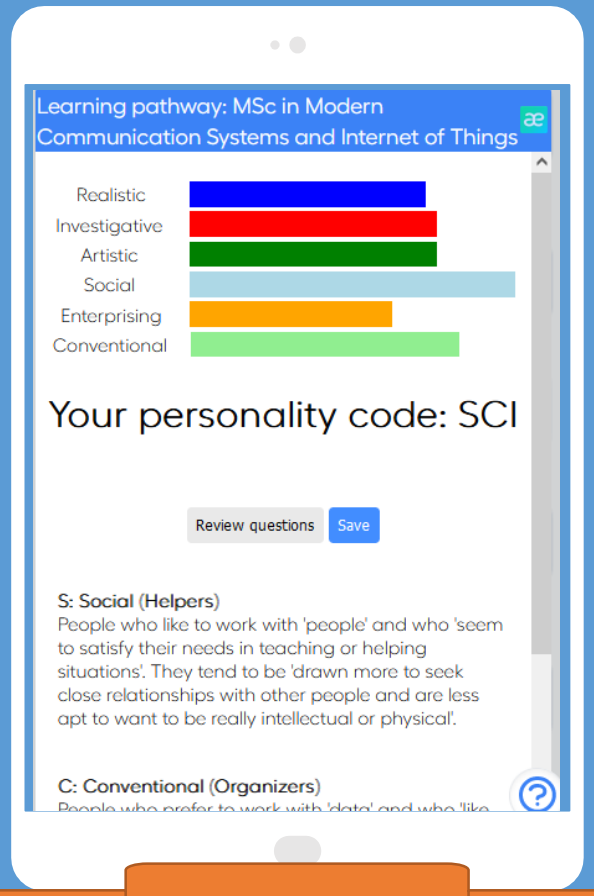
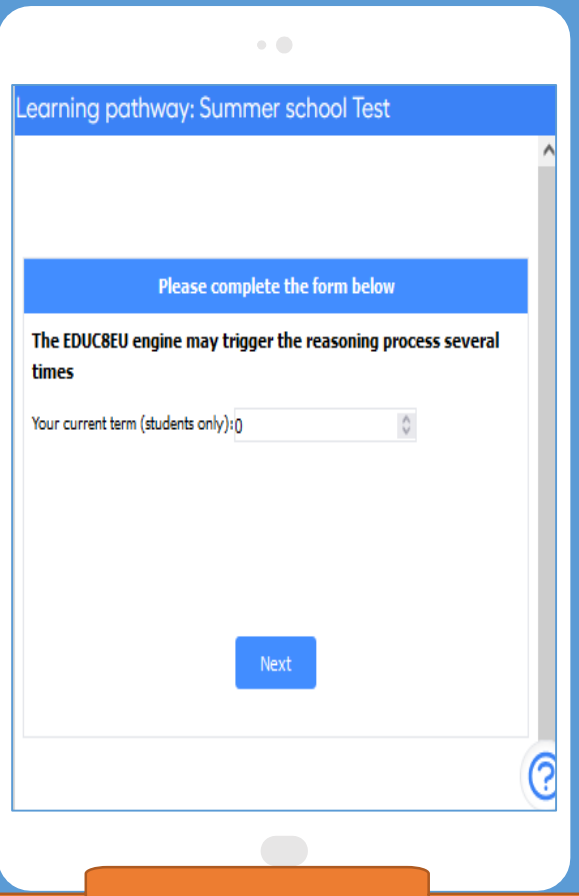
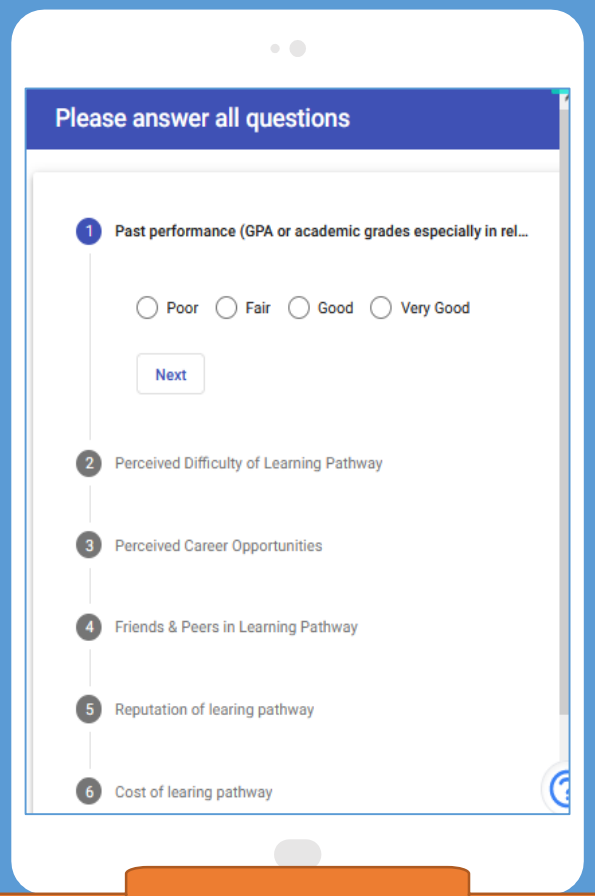


Semantic web



AI



Fuzzy Logic

State of the art technologies

References and further reading

- Iatrellis, O., Stamatiadis, E., Samaras, N. *et al.* An intelligent expert system for academic advising utilizing fuzzy logic and semantic web technologies for smart cities education. *Journal of Computers in Education, Springer Nature* (2022). https://doi.org/10.1007/s40692-022-00232-0

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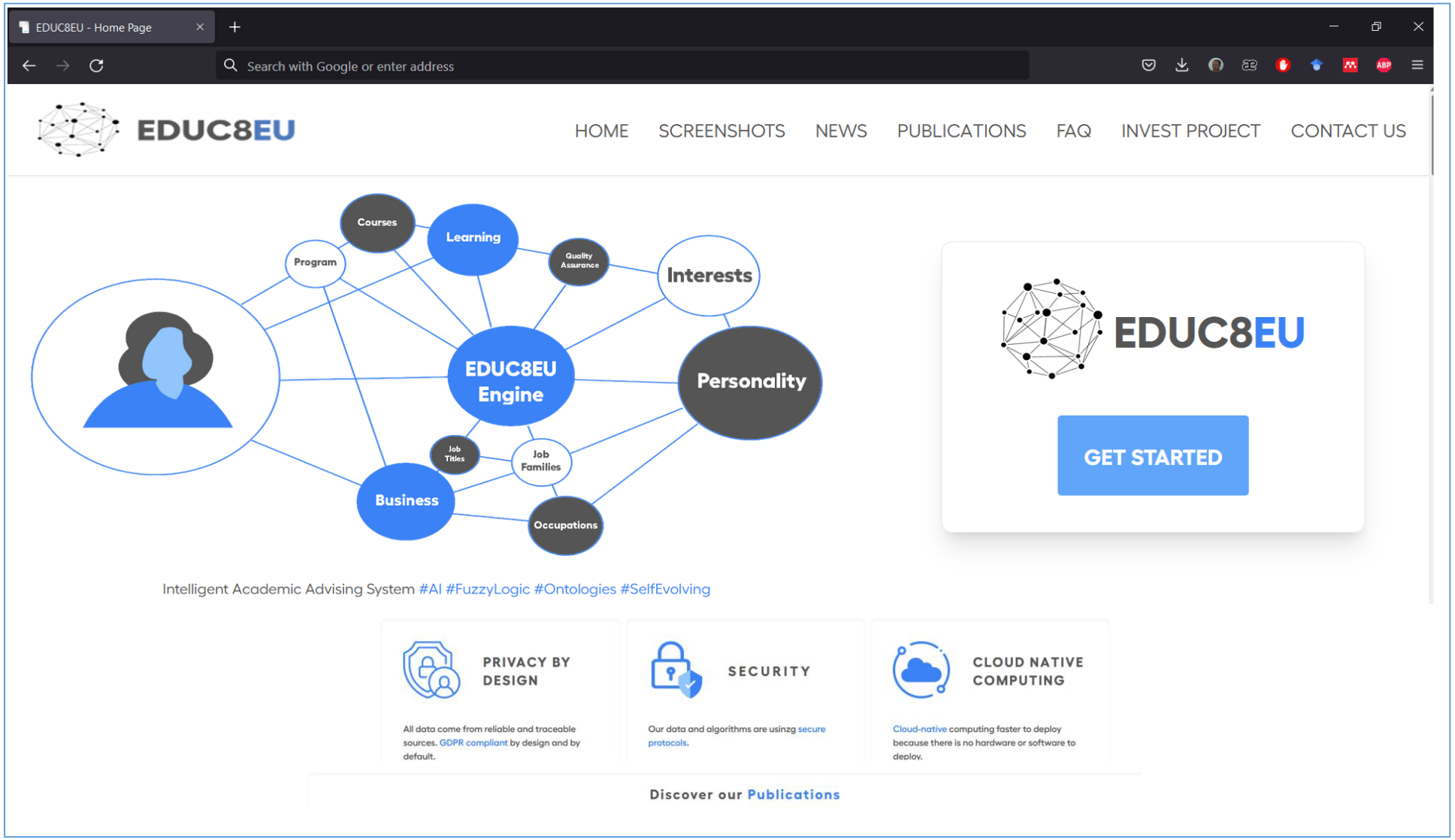
EDUC8EU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Learning
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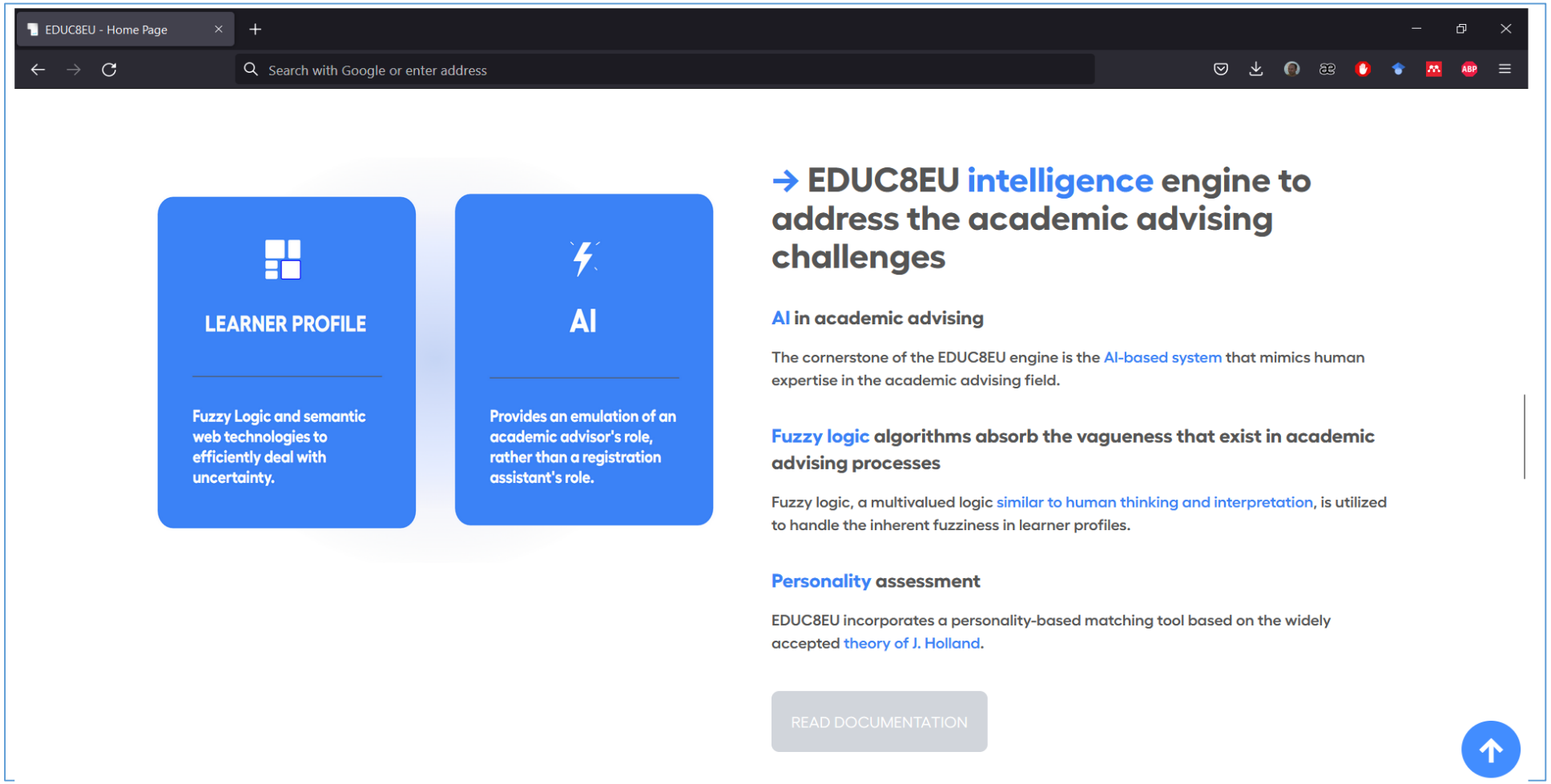
Interests
EDUC8EU Engine
Personality
Job Titles
Job Families
Business
Occupations
EDUC8EU
GET STARTED
Intelligent Academic Advising System #AI #FuzzyLogic #Ontologies #SelfEvolving
PRIVACY BY DESIGN
All data come from reliable and traceable sources. GDPR compliant by design and by default.
SECURITY
Our data and algorithms are usinzg secure protocols.
CLOUD NATIVE COMPUTING
Cloud-native computing faster to deploy because there is no hardware or software to deploy.
Discover our Publications

EDUC8EU



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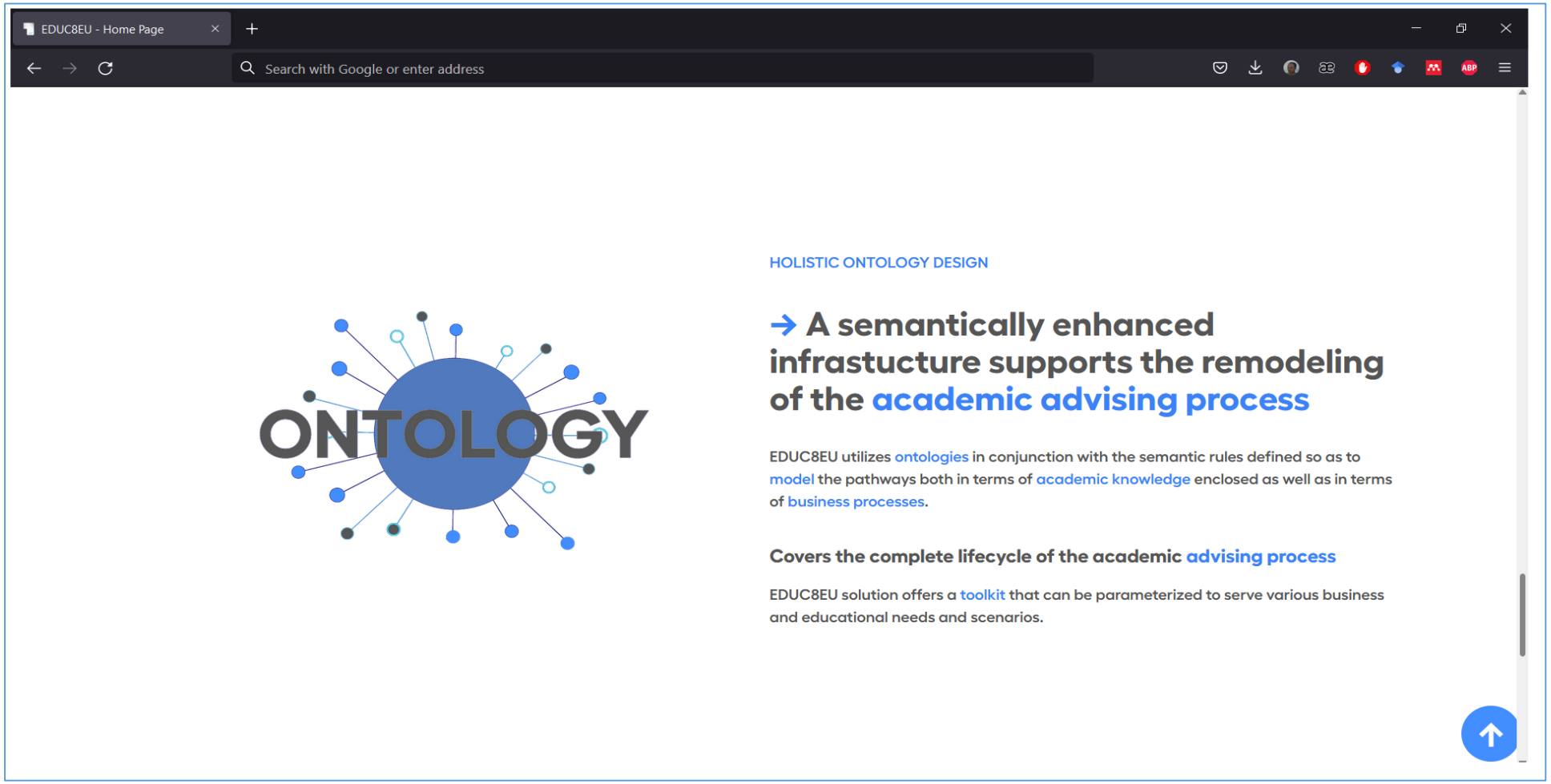
EDUC8EU



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EDUC8EU

EDUC8EU - Home Page

search with Google or enter address

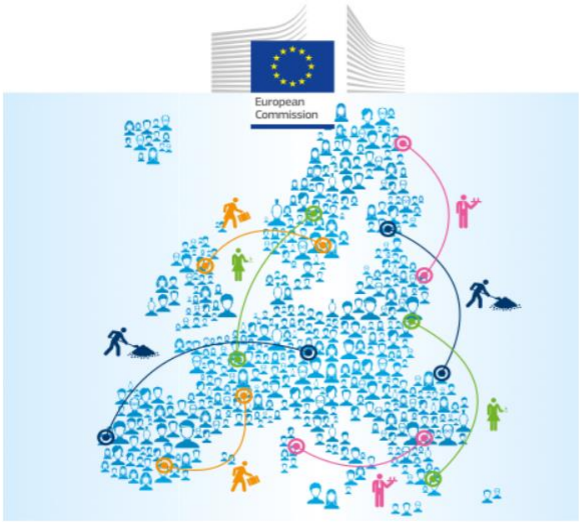
GLOBALLY RECOGNIZED REPOSITORIES

→ EDUC8EU consolidates and analyzes data from valid sources

Our database is constantly being enhanced with new data from many popular and heavily researched career inventories such as the ESCO classification, O*Net, ILO.

INVEST programs are supported at all three study cycles: bachelor, master, and doctoral, together with the living labs, Winter/Summer schools, and other extracurricular educational activities.

*European Classification of Skills/Competences, Qualifications and Occupations (ESCO) is an initiative Europe 2020 of the European Commission.

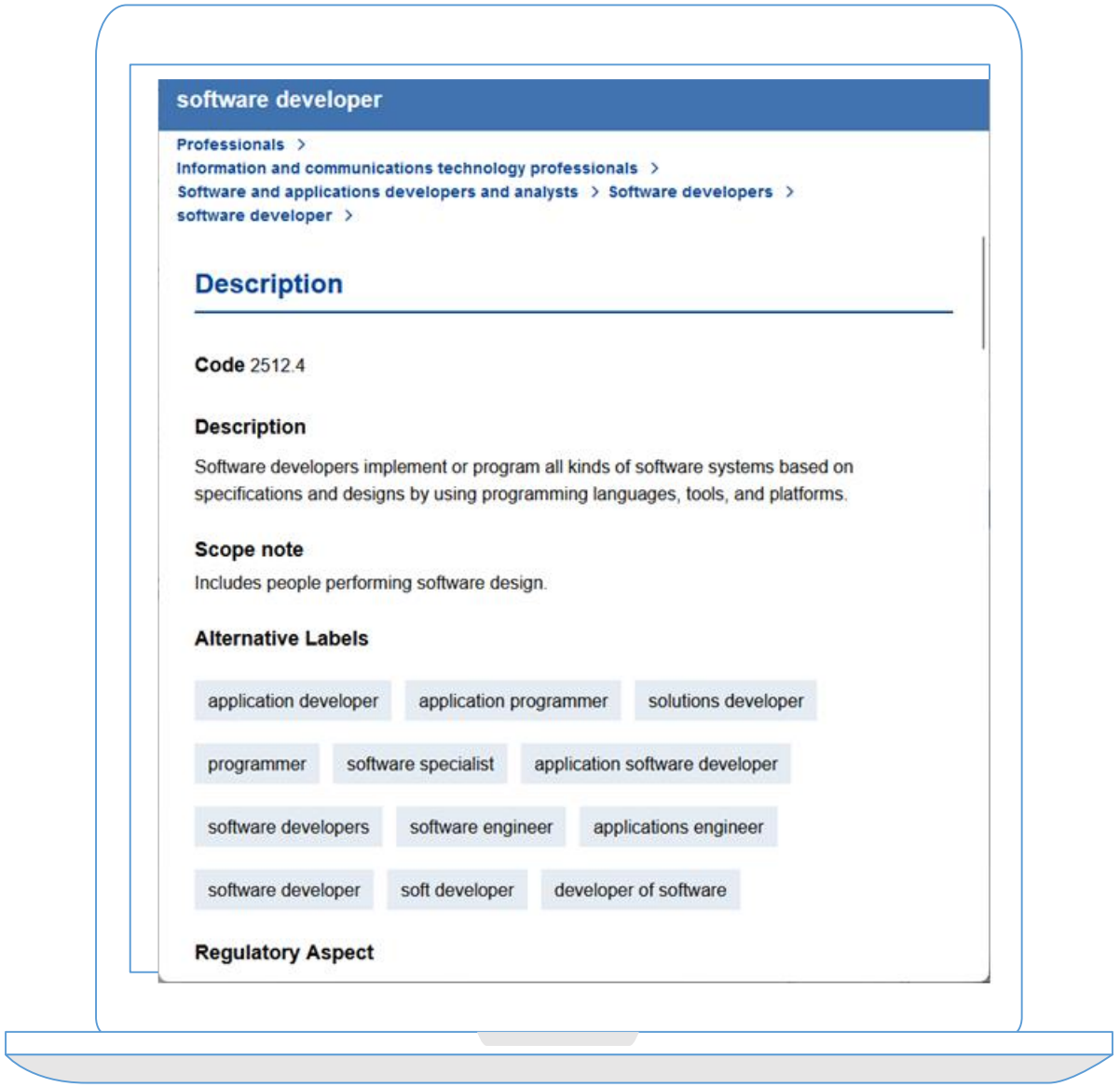


But, how can we populate our knowledge base with facts?

ESCO

ESCO (European Skills, Competences, Qualifications and Occupations) works like a dictionary, describing, identifying and classifying professional occupations and skills relevant for the EU labour market

https://esco.ec.europa.eu



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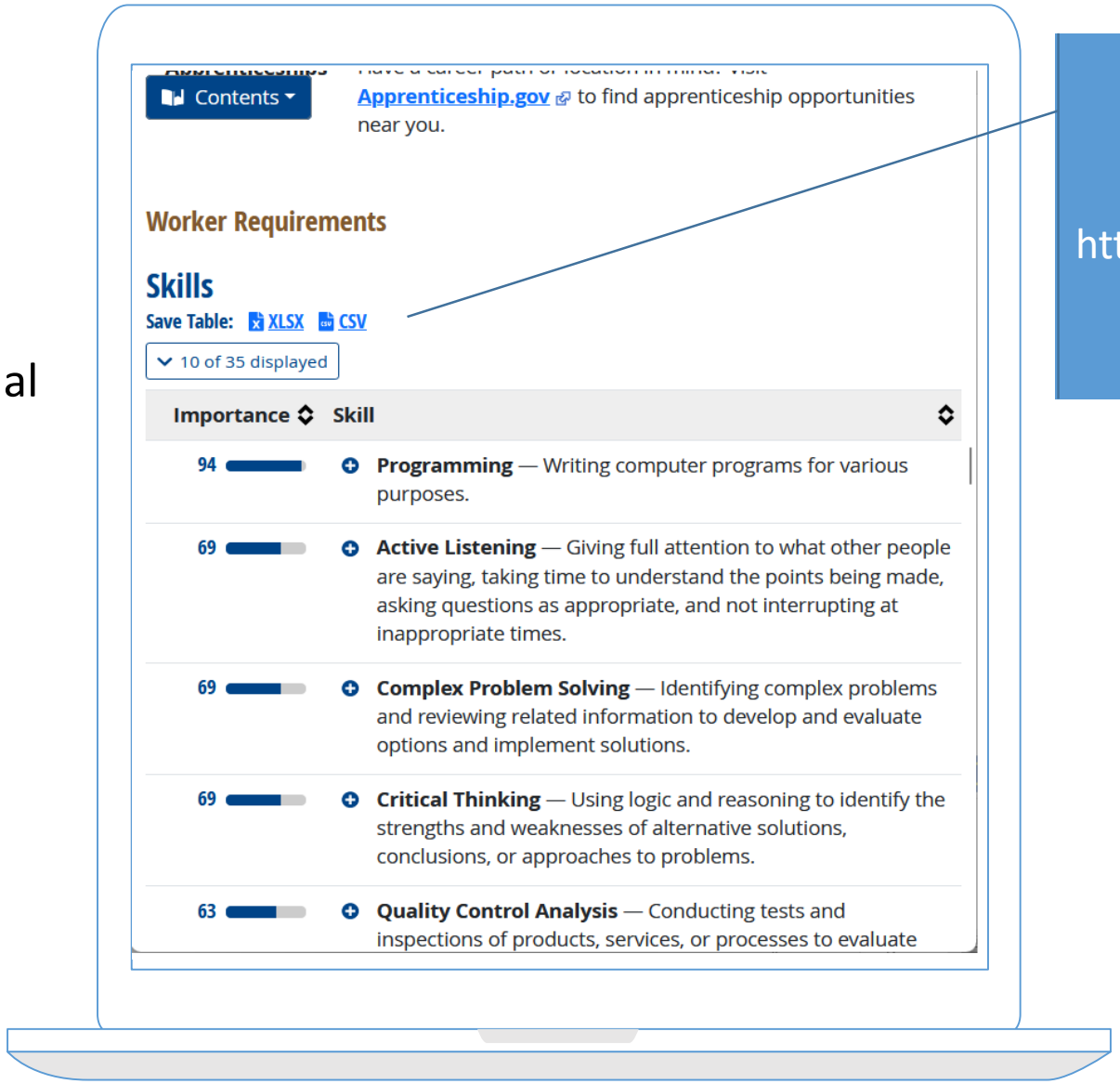
O*NET

The O*NET Library is the primary source of occupational information in US

https://www.onetonline.org/



Computer Programmers
15-1251.00
https://www.onetonline.org/link/details/15-1251.00

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O*NET

The O*NET Library is the primary source of occupational information in US

https://www.onetonline.org/

Contents

Interests

Save Table: XLSX CSV

All 6 displayed

Occupational Interest	Interest
100	**Investigative** — Investigative occupations frequently involve working with ideas, and require an extensive amount of thinking. These occupations can involve searching for facts and figuring out problems mentally.
78	**Conventional** — Conventional occupations frequently involve following set procedures and routines. These occupations can include working with data and details more than with ideas. Usually there is a clear line of authority to follow.
39	**Realistic** — Realistic occupations frequently involve work activities that include practical, hands-on problems and solutions. They often deal with plants, animals, and real-world materials like wood, tools, and machinery. Many of the occupations require working outside, and do not involve a lot of paperwork or working closely with others.
33	**Artistic** — Artistic occupations frequently involve working with forms, designs and patterns. They often require self-expression and the work can be done without following a

Computer Programmers
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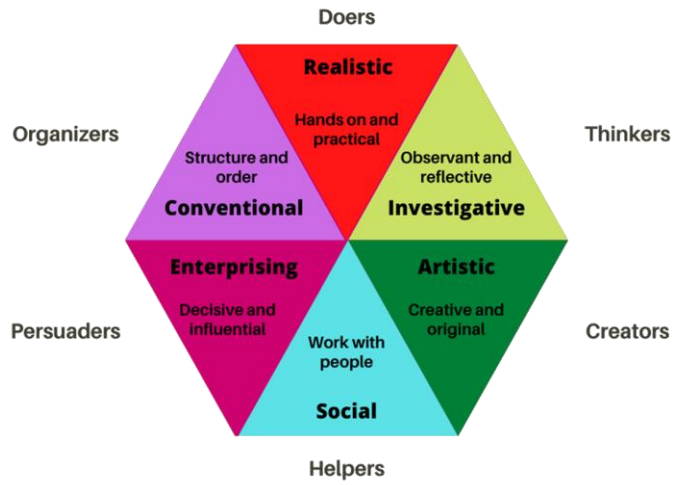
https://www.onetonline.org/link/details/15-1251.00



O*NET

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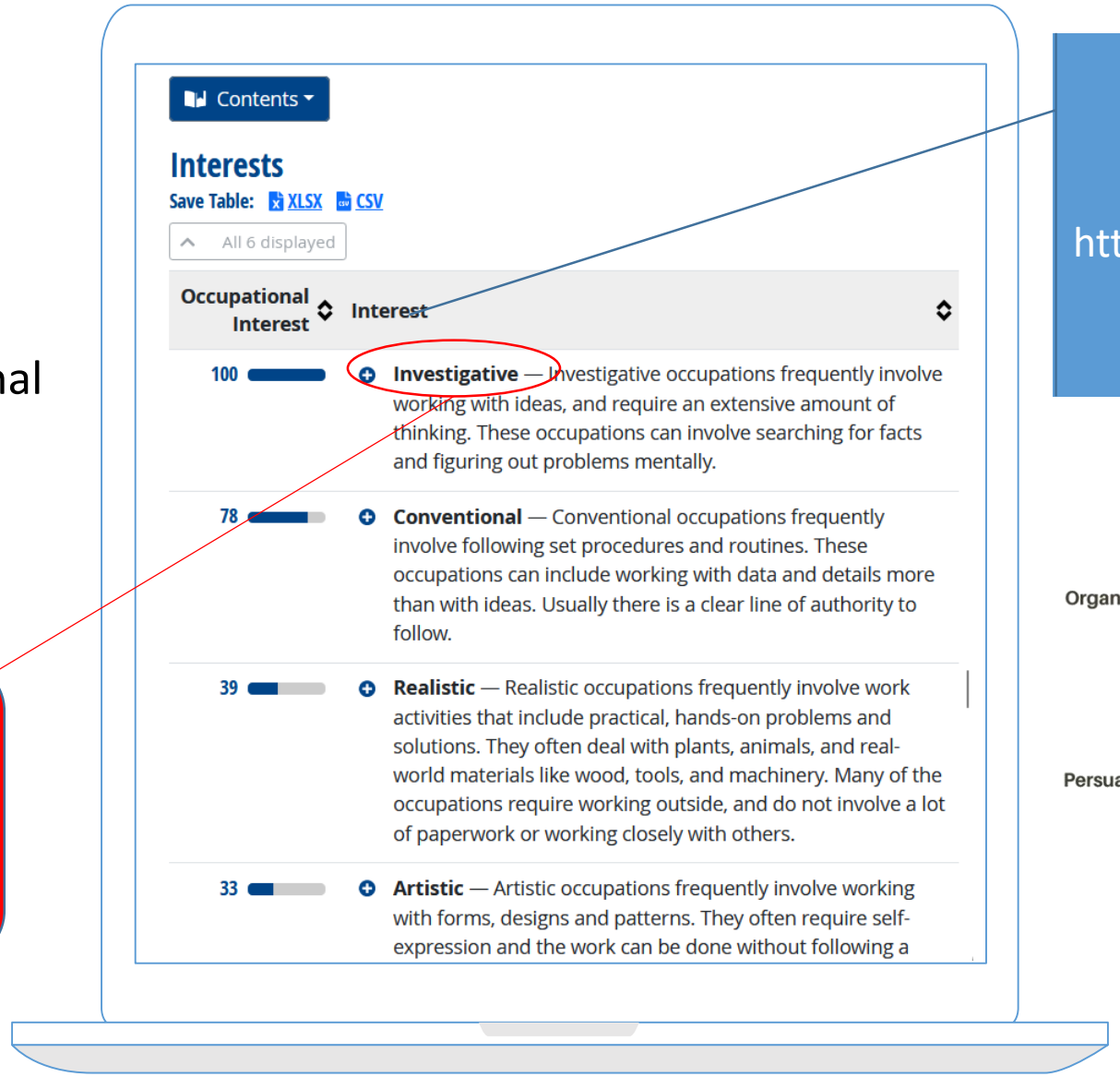
https://www.onetonline.org/

Fact: The ideal personality type for the Computer Programmers is “Investigative”



Computer Programmers
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https://www.onetonline.org/link/details/15-1251.00

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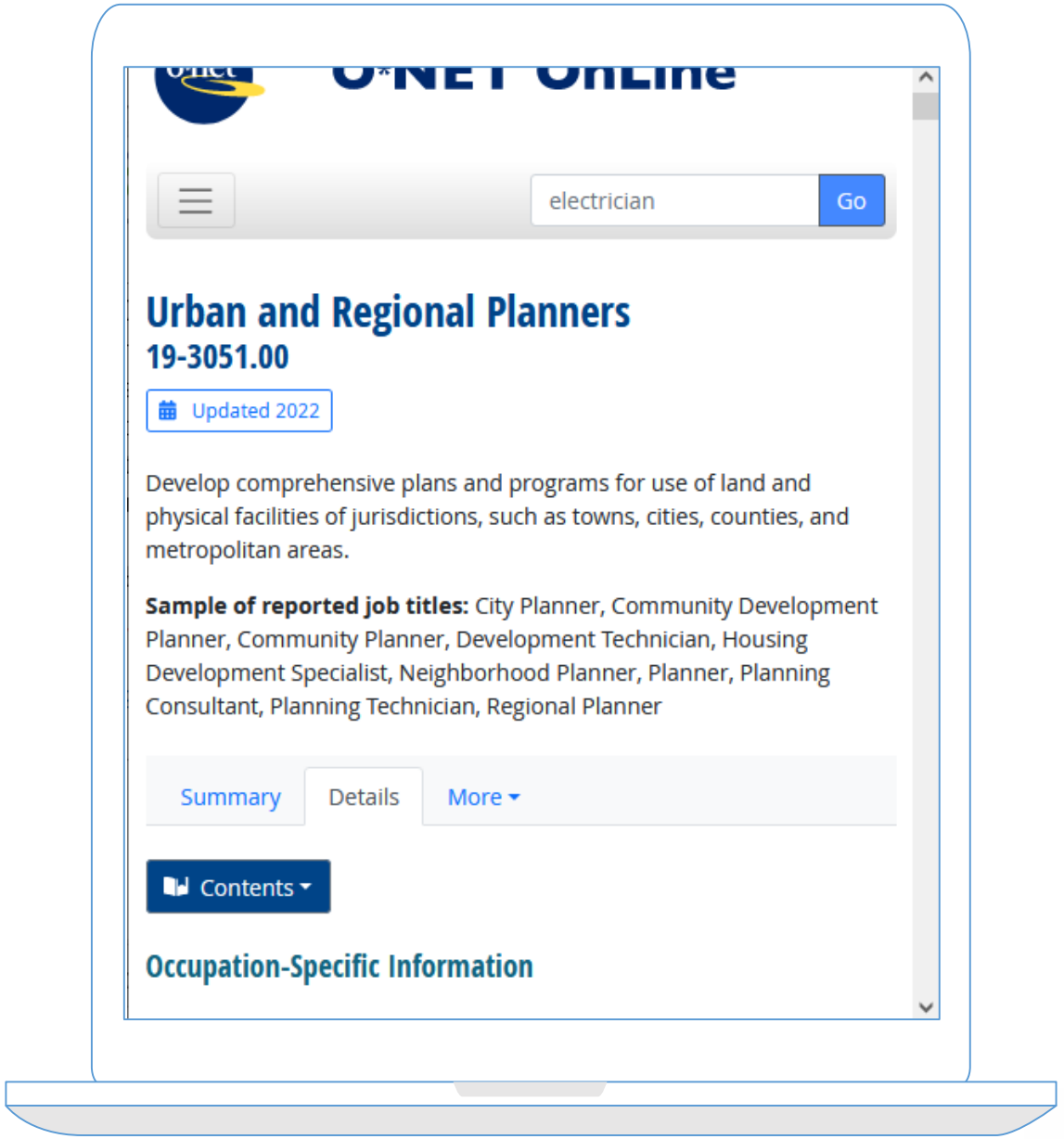
how can we populate our knowledge base with facts about the "**SUSTAINABLE URBAN DEVELOPMENT**" program?

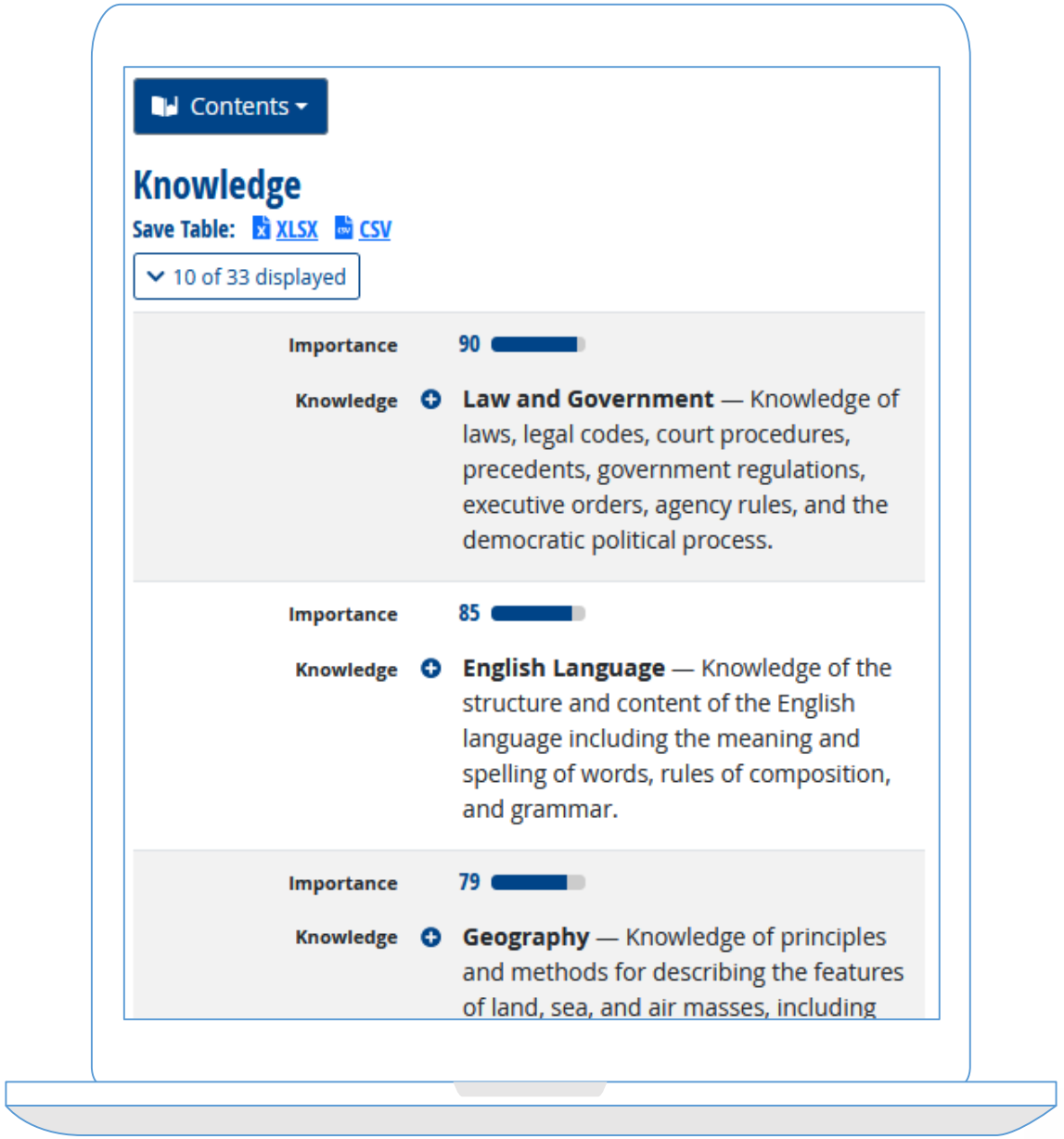
Onet


electrician
Go
Urban and Regional Planners
19-3051.00
Updated 2022
Develop comprehensive plans and programs for use of land and physical facilities of jurisdictions, such as towns, cities, counties, and metropolitan areas.
Sample of reported job titles: City Planner, Community Development Planner, Community Planner, Development Technician, Housing Development Specialist, Neighborhood Planner, Planner, Planning Consultant, Planning Technician, Regional Planner
Summary
Details
More
Contents
Occupation-Specific Information

Onet

Fact: The learner must have a strong background in the following cognitive areas:

- Law and government
- English Language
- Geography



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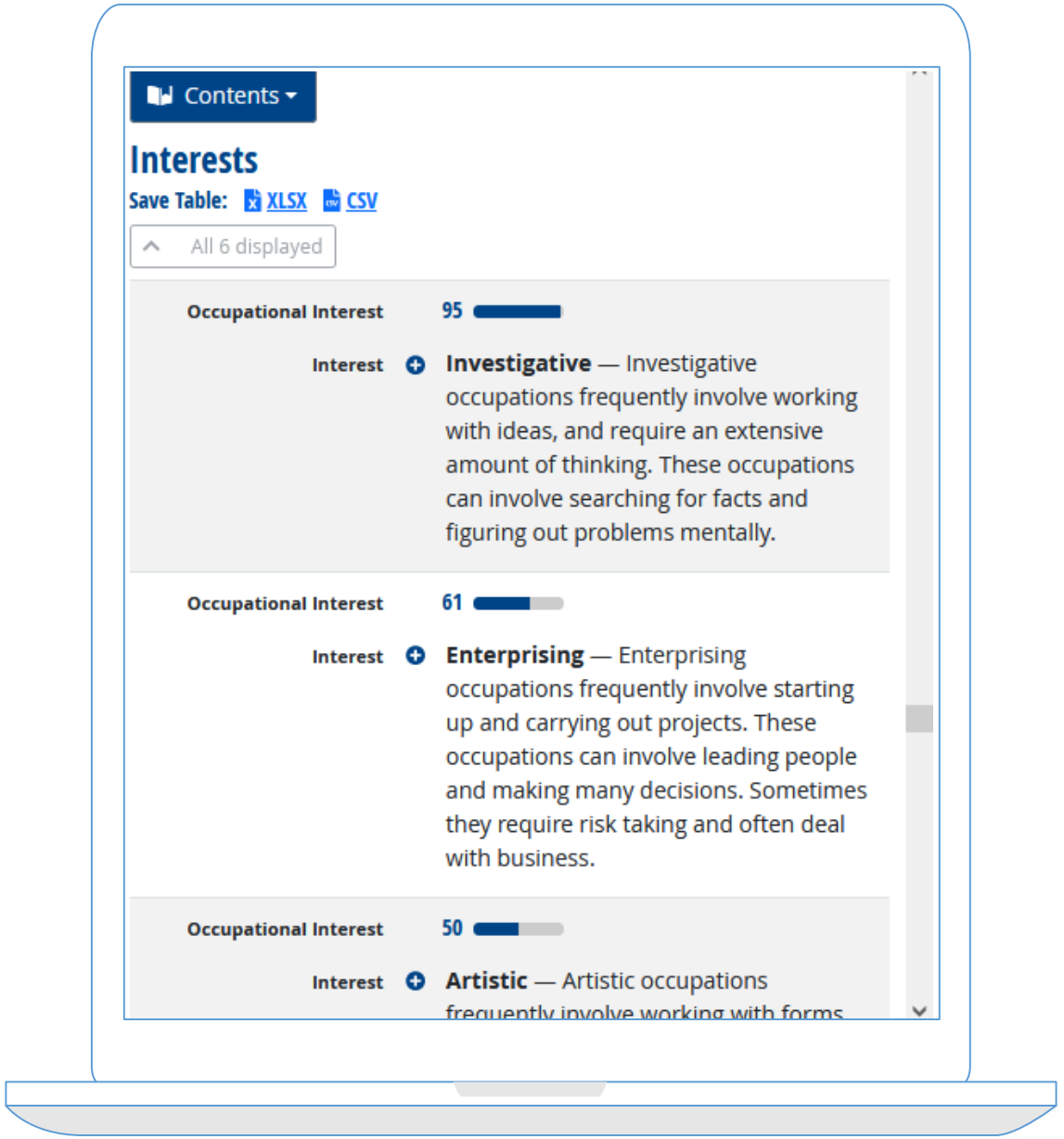
Onet



Fact: The 3-letter personality code which is related to the “SUSTAINABLE URBAN DEVELOPMENT” program is IEA

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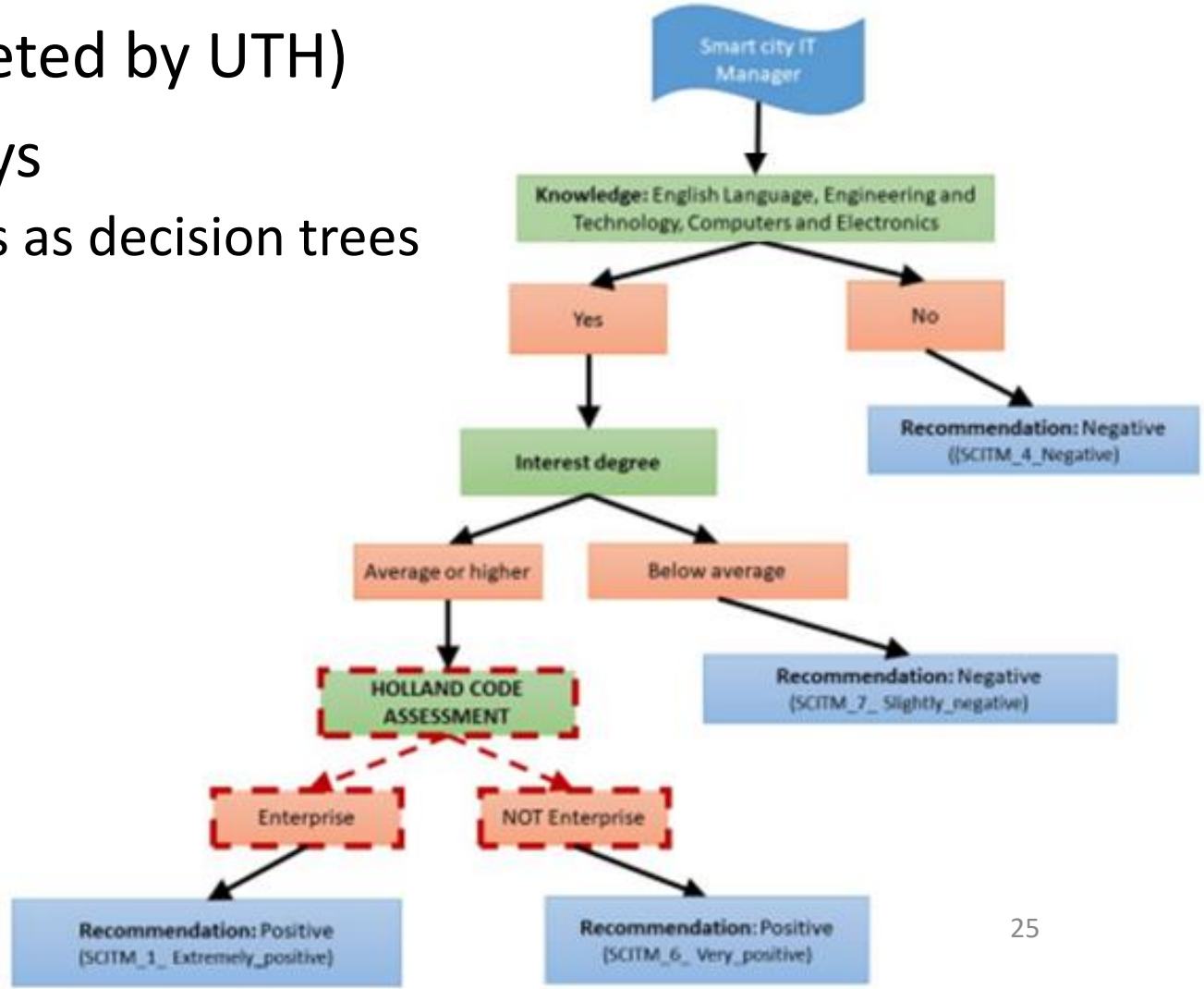
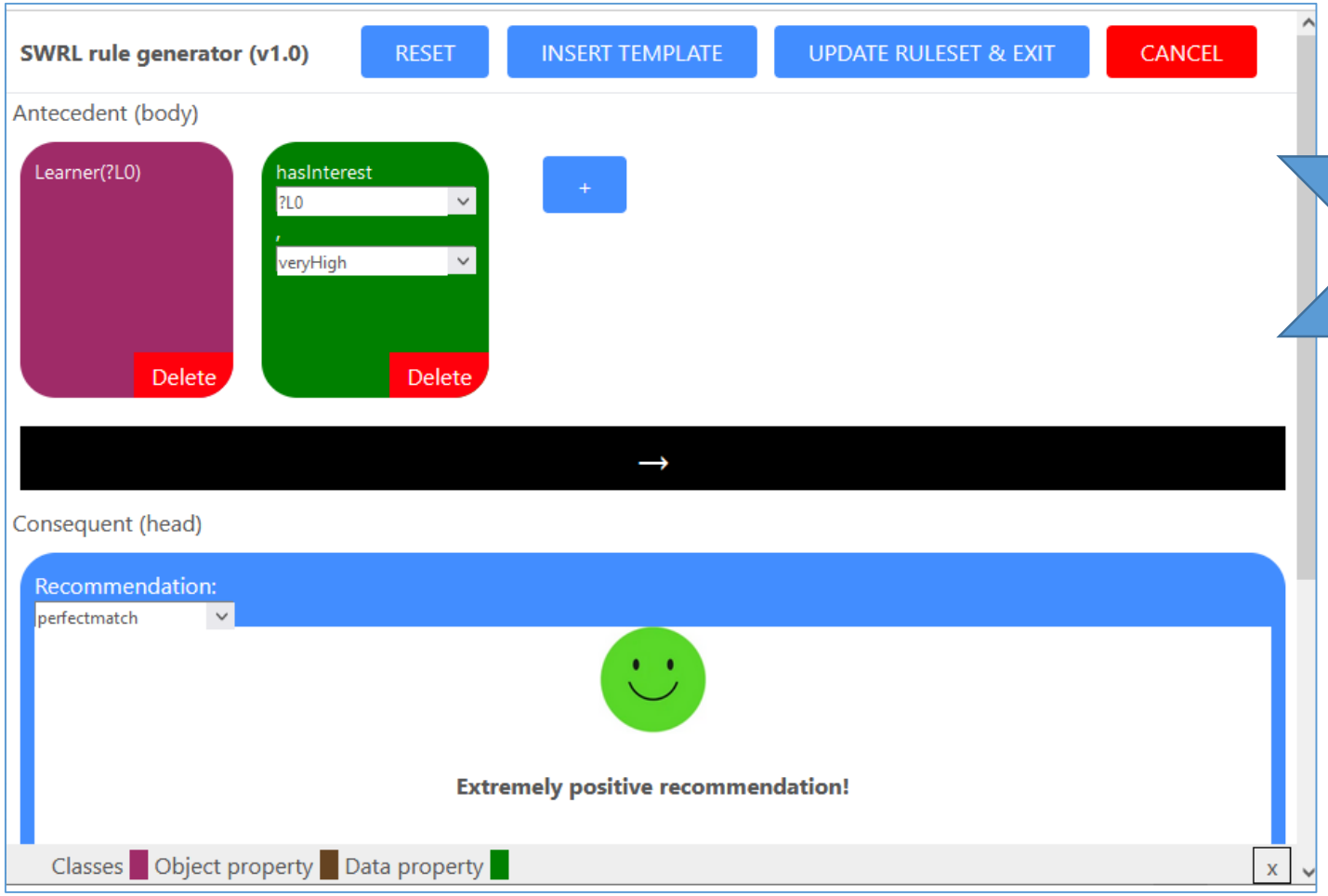
Realization methodology

1. ~~Knowledge representation~~ (Completed by UTH)
2. Select and review learning pathways
   - Represent academic advising guidelines as decision trees
3. Implementation of rules
   - Using the implemented GUI



Semantic rule generator



EDUC8EU

Learner(?L0) ^
hasInterest(?L0,veryHigh)
-> hasName(?P1,
"perfectmatch")

How is the reasoning process performed?

- A ruleset usually contains more than one rule.
- The rules are checked in order from top to bottom.

Rule #1: if student hasPersonality("IES") and hasSatisfactorySkill(ENGLISH) and hasSatisfactoryCompletedCourse("AI") then Recommendation("Extremely Positive")
Rule #2: if student hasInterest("high") then Recommendation("Positive")
Rule #3: if student hasInterest("high") and hasTerm(>4) then Recommendation("Very Positive")

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How reliable are EDUC8EU results?

- Since EDUC8EU is used for self-reporting purposes, the user has less vested interest in 'lying’.

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How reliable are EDUC8EU results?

- Since EDUC8EU is used for self-reporting purposes, the user has less vested interest in 'lying'.
- **EDUC8EU should be considered as a tool rather than an exam with a result that's directive**, thus its reliability doesn't have to matter as much.
- EDUC8EU **offers a springboard from which to start the self-exploration process** on what is suitable or interesting, why it is suitable or interesting and to unpick the result in relation to what you feel is the right thing to do.

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Presentation of EDUC8EU software

EDUC8EU walkthrough

- http://www.cs.teilar.gr/iatrellis/EDUC8EU

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Limitations

Some key limitations

1. RULES do not support negated atoms or negation as failure

Example 1

If Not hasMSc -> NotEligibleForProgramX (Not supported)

If hasNotMSc -> NotEligibleForProgramX (valid)

2. The inclusive "OR" operator cannot be used to exclusively separate atoms

- two separate rules can be written to achieve the same result, instead of one rule using the inclusive "OR" operator.

Example 2

If hasGPA>8 OR hasMSc -> EligibleForProgramX (Not supported)

If hasGPA>8 -> EligibleForProgramX (valid)

If hasMSc -> EligibleForProgramX (valid)

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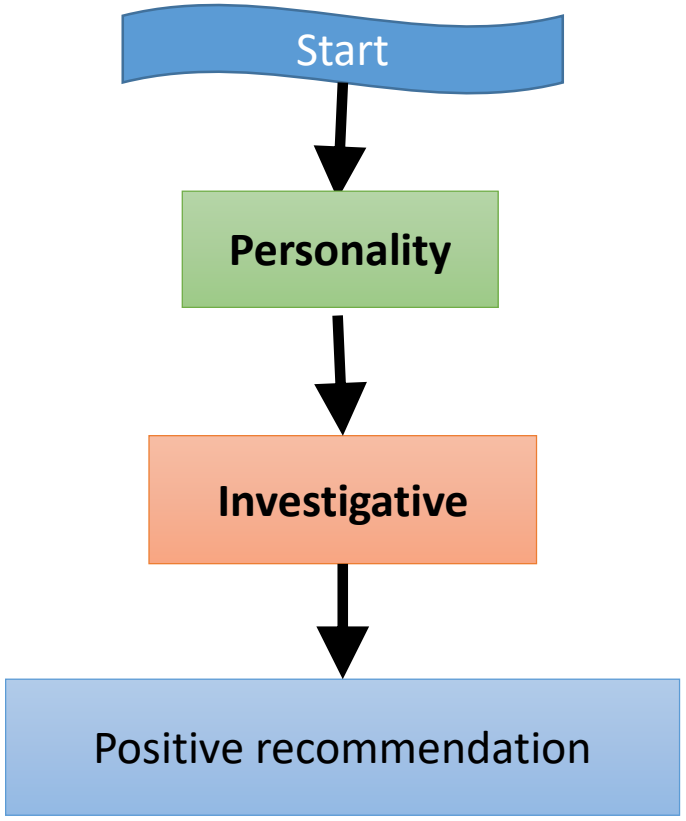
Ruleset examples

1. produce a "Positive recommendation" message if the student has an I (Investigative) personality



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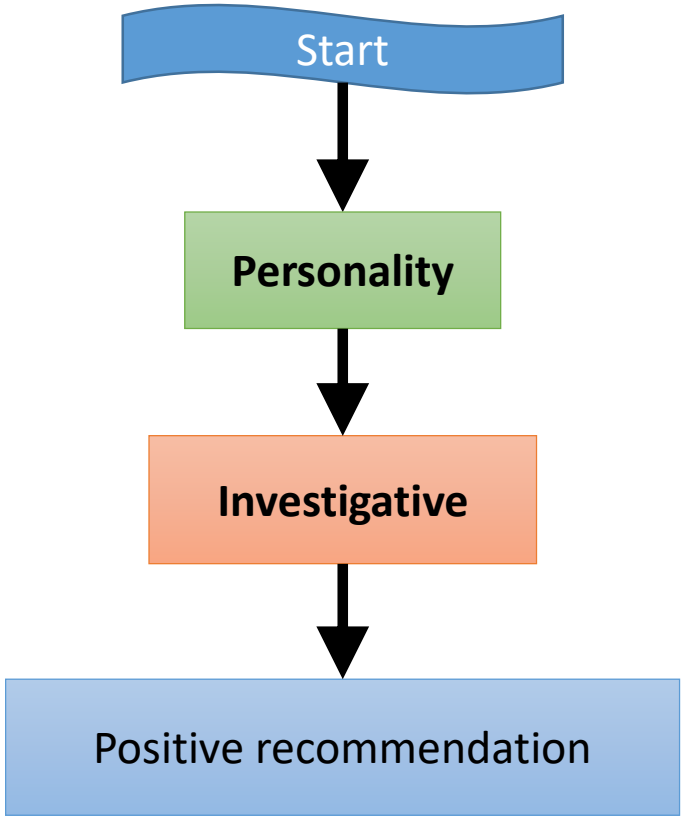
Ruleset examples

2. Produce a "Positive recommendation" message if the student has a personality **different** than I (Investigative)



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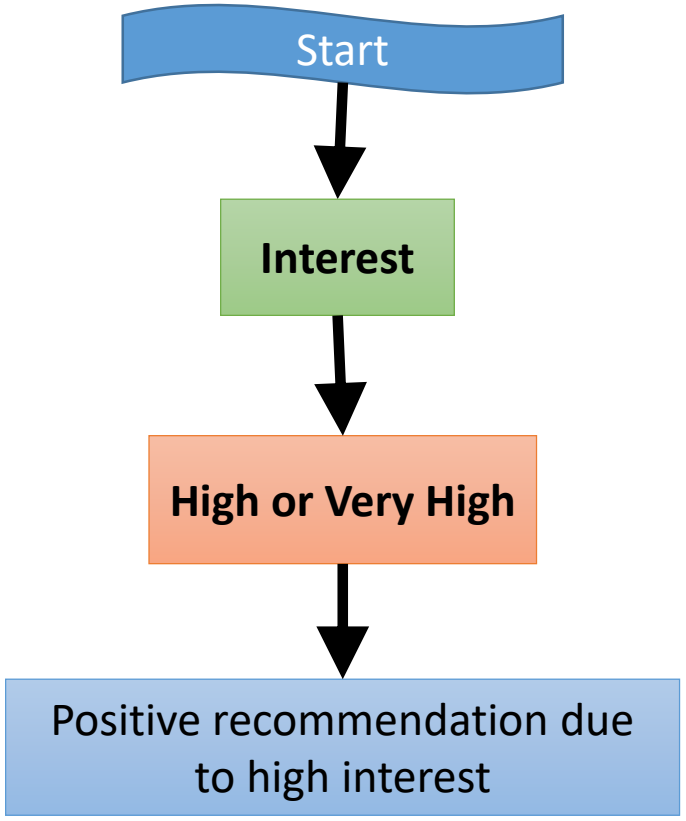
Ruleset examples

3. Produce a "Positive recommendation due to high interest" message if the student has at least a "High" interest degree



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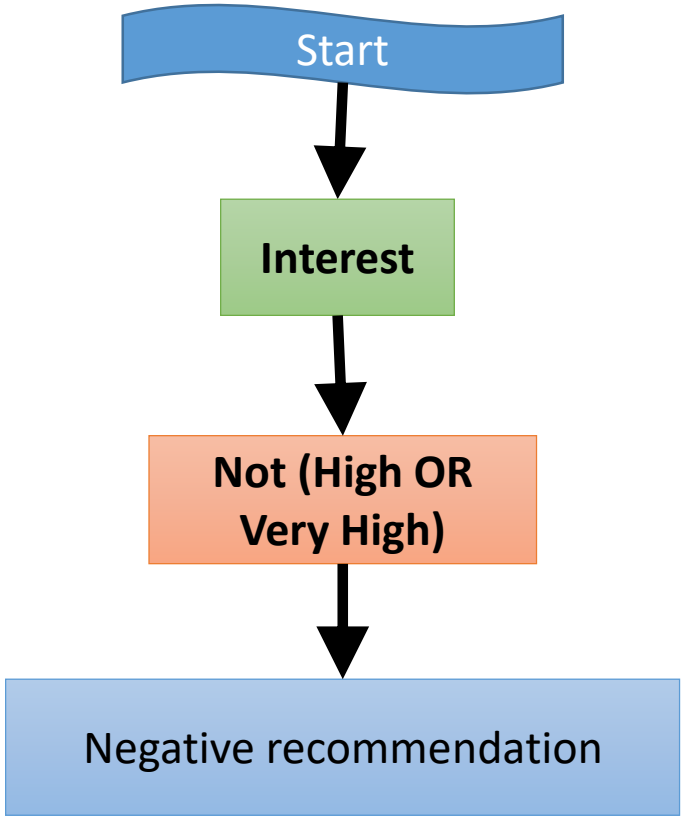
Ruleset examples

4. Edit the previous ruleset so that it will produce a "Negative recommendation" message if the student has NOT a "High" or "Very high" interest degree



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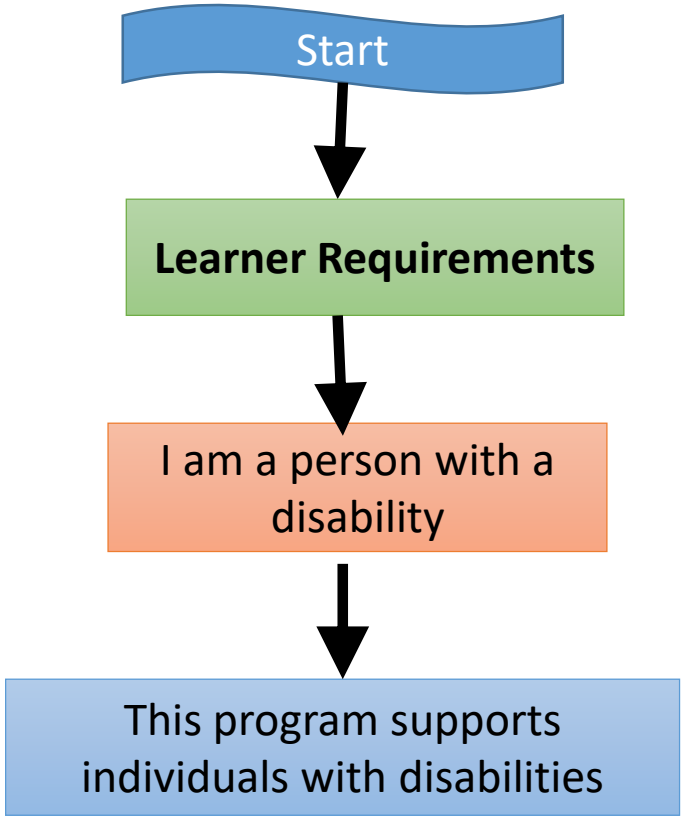
Ruleset examples

5. Define a Learner requirement "I am a person with a disability". If this condition is satisfied the rule must produce the message "This program supports individuals with disabilities“



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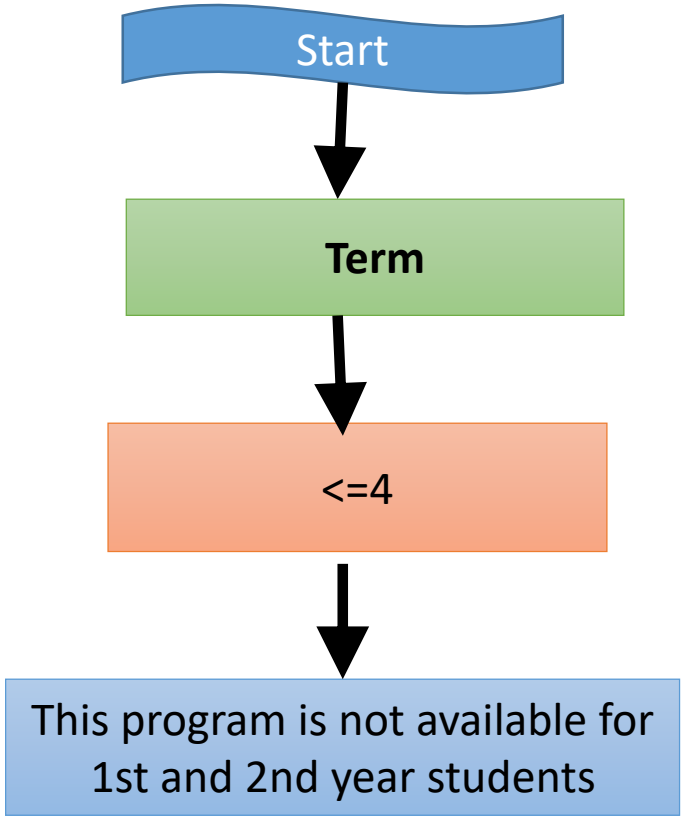
Ruleset examples

6. Add a rule that will produce "This program is not available for 1st and 2nd year students" when the student has term Less or Equal than 4

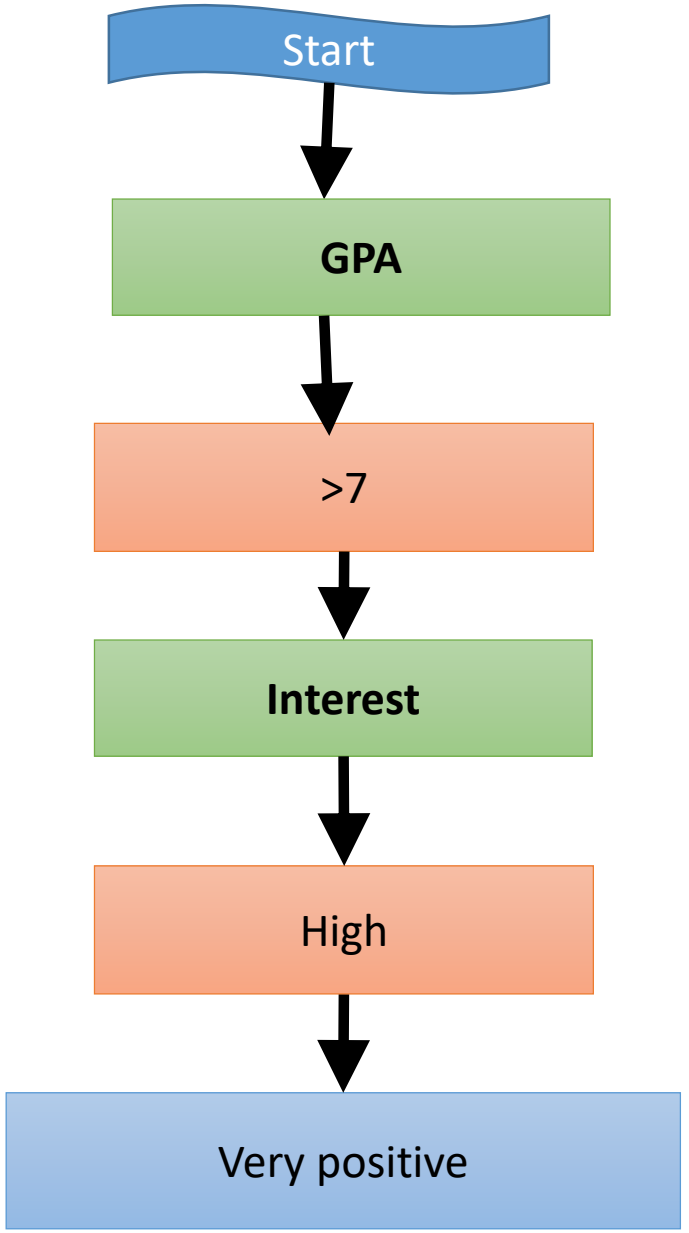


Ruleset examples

7. A rule may contain multiple elements

Add a new ruleset with a single rule.

The rule will produce "Very positive" for students with GPA greater than 7 provided that they have at least a high Interest degree



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Ruleset examples

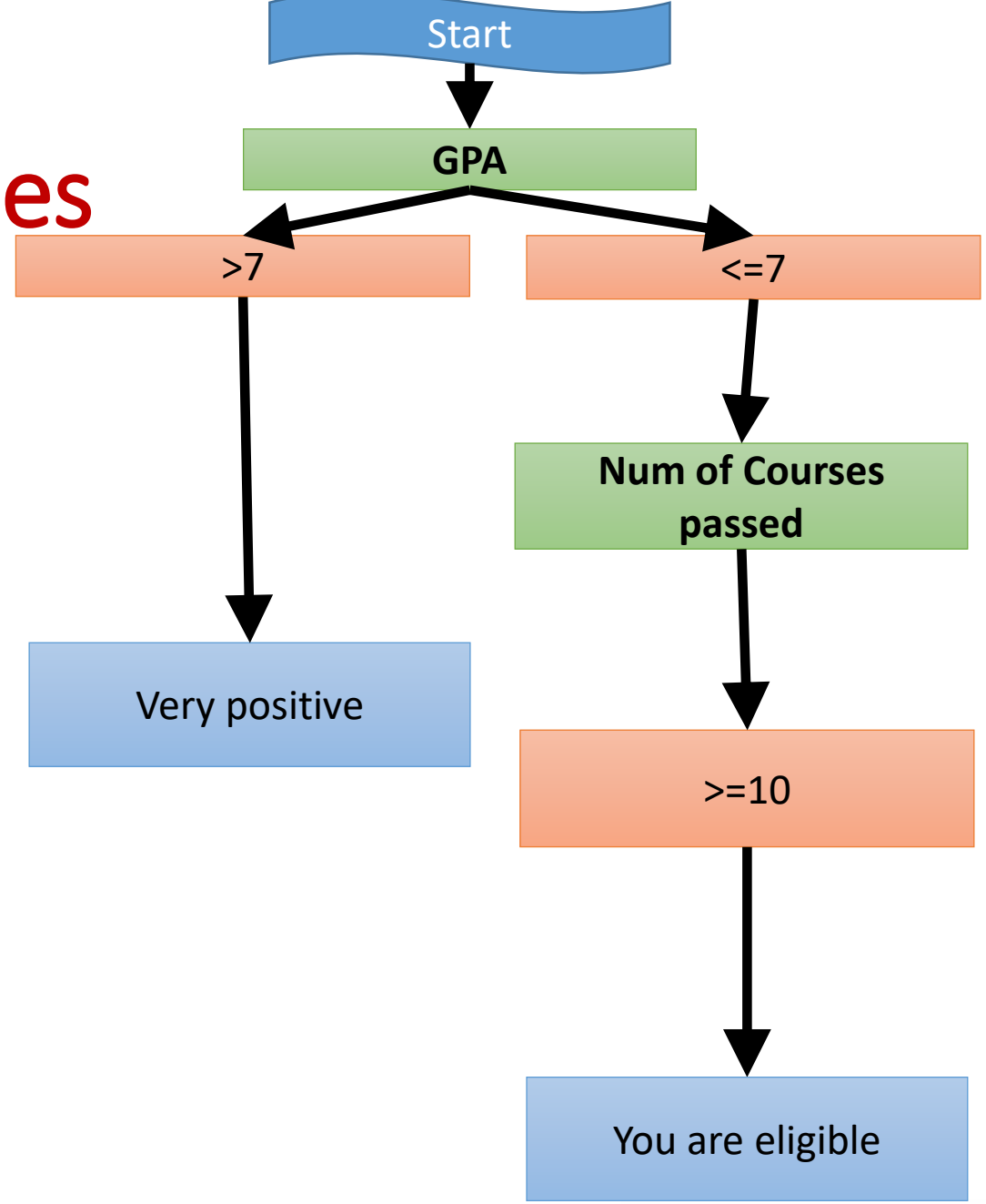
8. A ruleset may contain multiple rules

Add a new ruleset with 2 rules

The first rule will produce "Very positive" for students with GPA greater than 7

The second rule will produce "You are eligible" for students that have passed at least 10 courses and have more than 100 credits.

Help:



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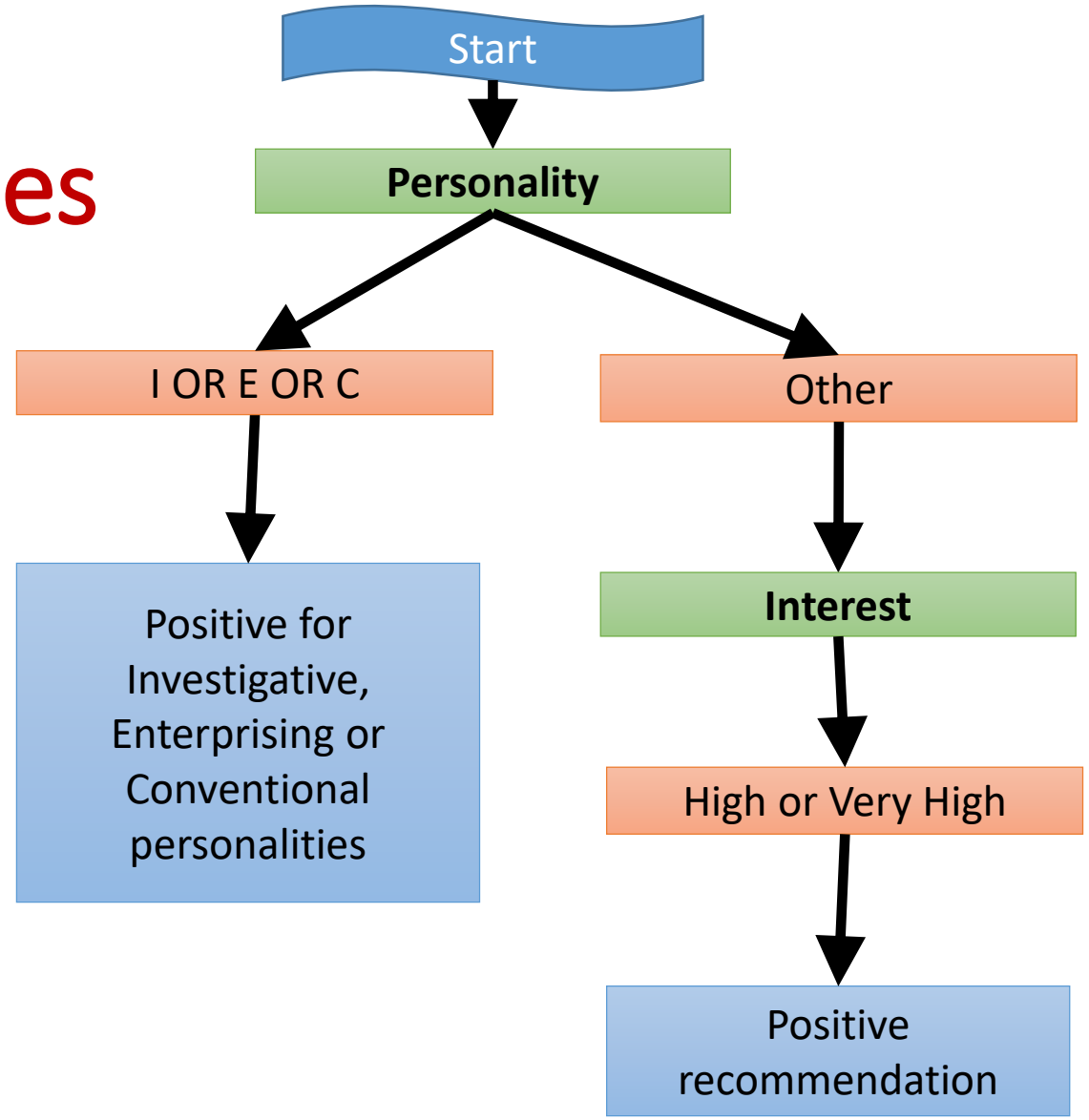
Ruleset examples

9. The inclusive "OR" operator cannot be used to exclusively separate atoms. Multiple separate rules can be written to achieve the same result, instead of one rule using the inclusive "OR" operator.

Add a new ruleset. The ruleset must produce a "Positive for Investigative, Enterprising or Conventional personalities" recommendation if student's personality type is "I" OR "E" OR "C". Moreover, if the student does not have a "I" OR "E" OR "C" personality type but his/her interest degree is High (Or Very high) then a "Positive recommendation" message must be generated.



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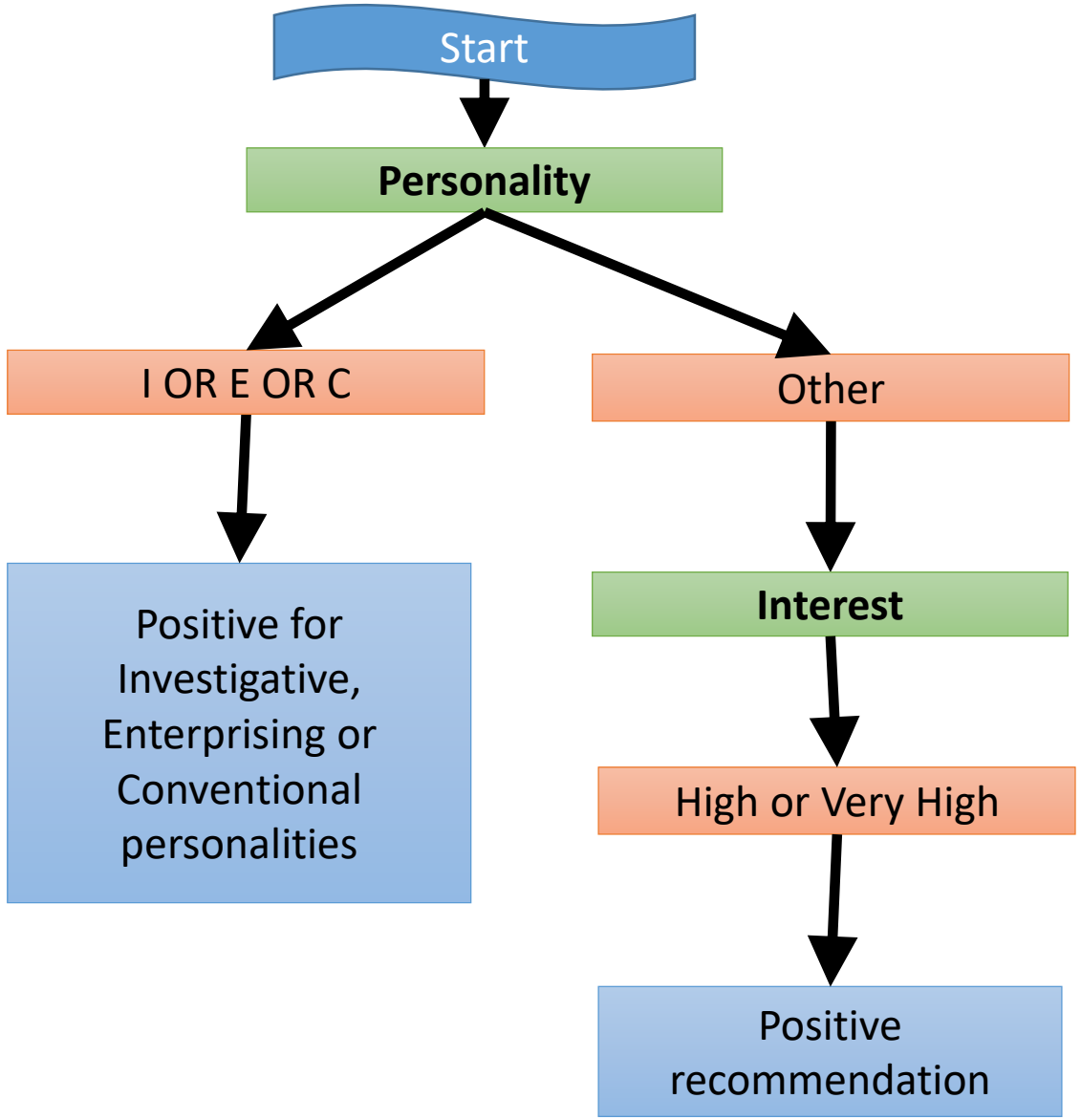
Ruleset examples

9. Reorder the rules so that the interest degree has a higher ranking than the student's personality type ("I" OR "E" OR "C").



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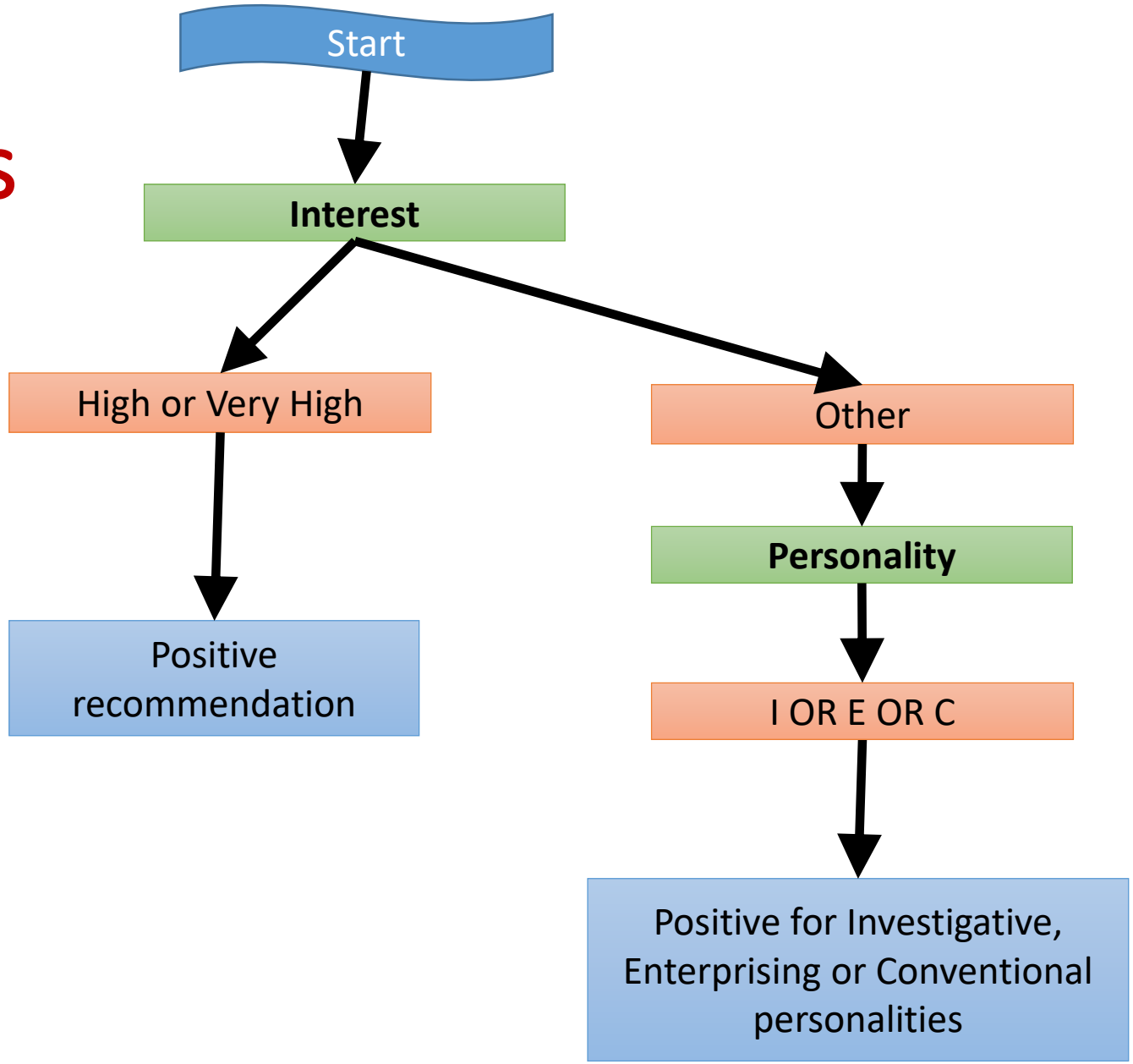
Ruleset examples

9. Reorder the rules so that the interest degree has a higher ranking than the student's personality type ("I" OR "E" OR "C").



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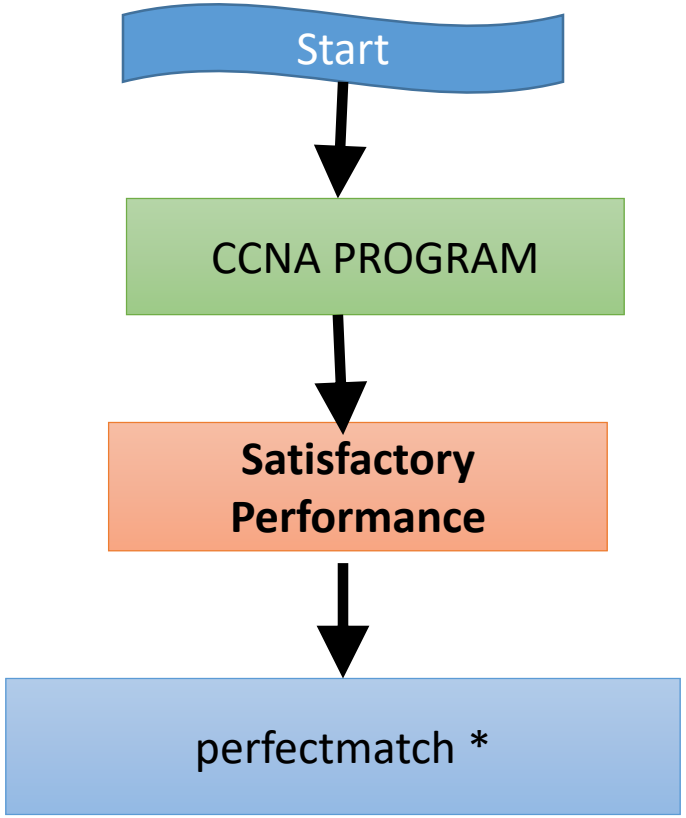
Ruleset examples

10. Most of the time a more explanatory recommendation is needed to increase the likelihood that the provided advice by EDUC8EU will be followed.

Add a new ruleset entitled "Ruleset 11 (PHY-GROUP-X)", Description: Exercise 11. Add a rule which will produce the "perfectmatch" rich text message for students who have satisfactorily completed the CCNA PROGRAM.

HELP: Use the object property "hasSatisfactoryPerformance" and set the second variable to CCNA PROGRAM. Select the **perfectmatch** value from the recommendations list



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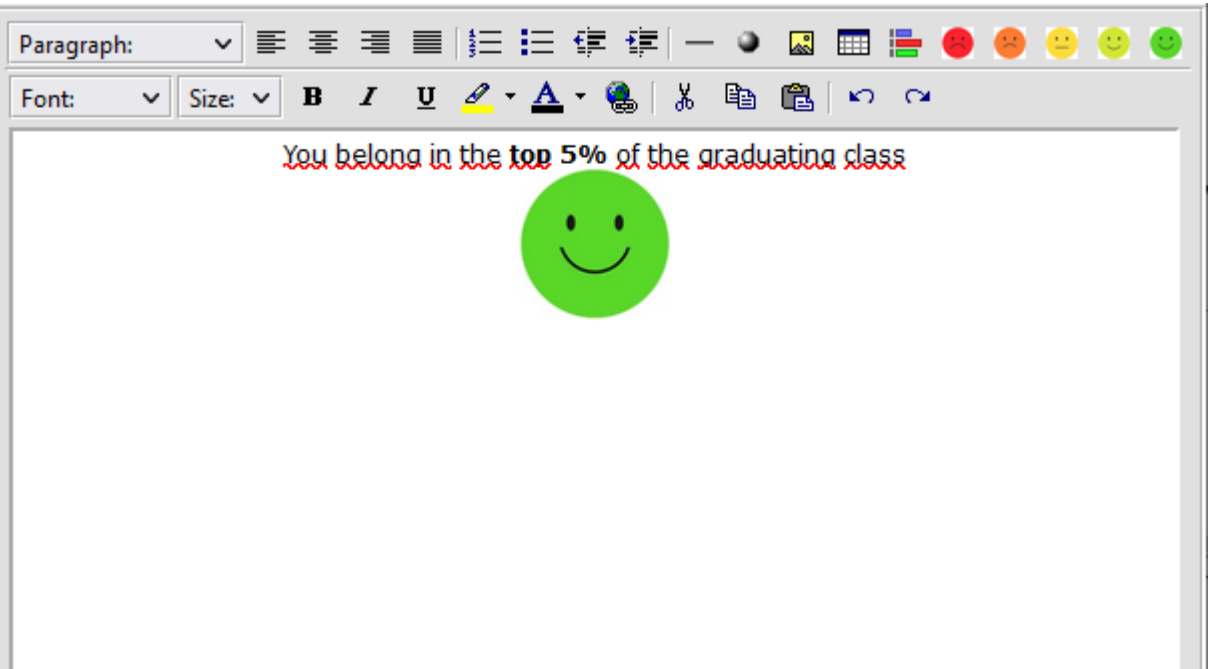
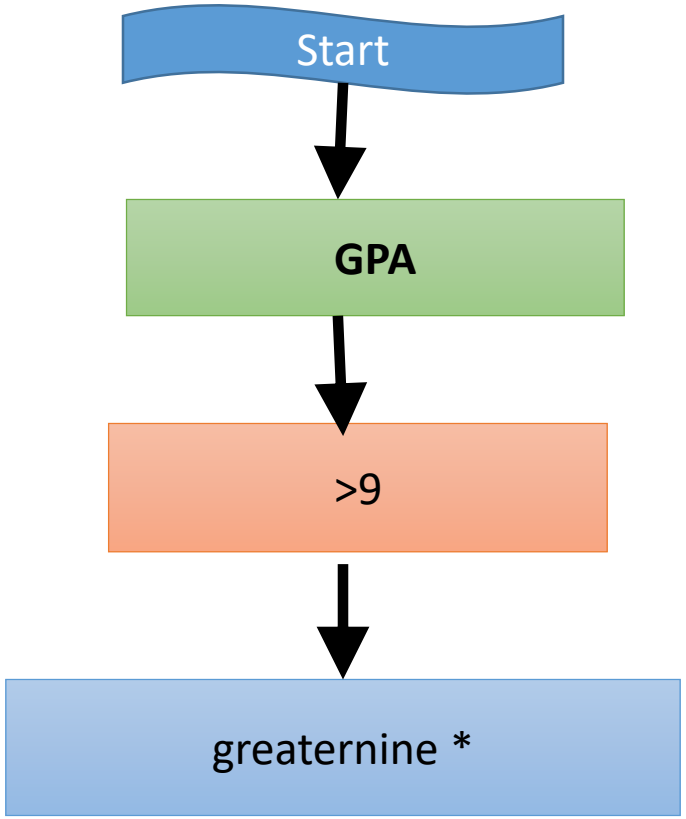
Ruleset examples

11. Add a new ruleset. Create a rule which will display a custom recommendation (see figure below) for students having a GPA greater than 9





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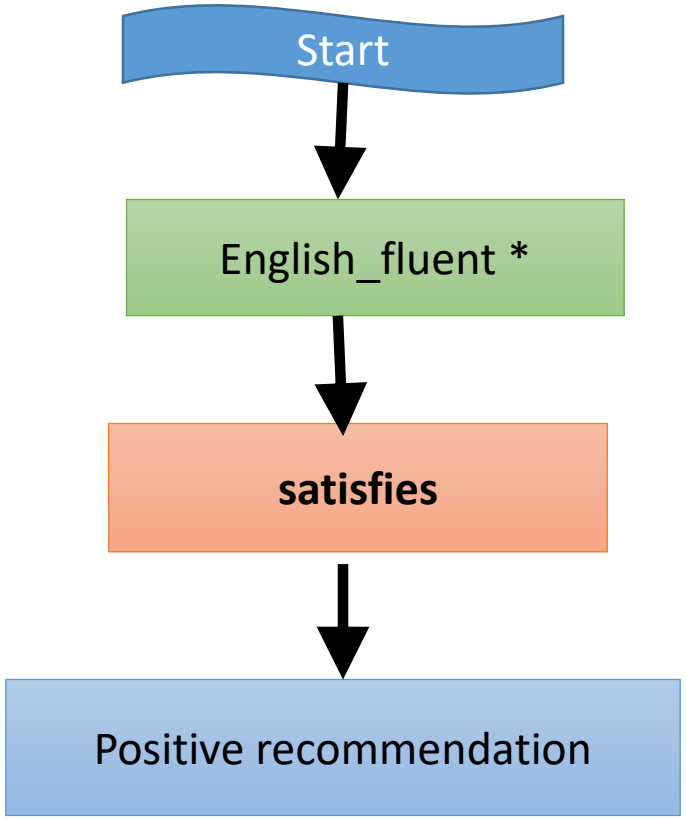
Ruleset examples

12. Built-in properties cannot contain special characters or formatting which could limit the expressivity of the language. To overcome this problem the "satisfies" property has been introduced which can be associated with meta-data.

Add a new ruleset. Create a rule using the "satisfies" property which will display the message "Positive recommendation" for students that speak english Fluently.

Select the english_fluent option of the satisfies control



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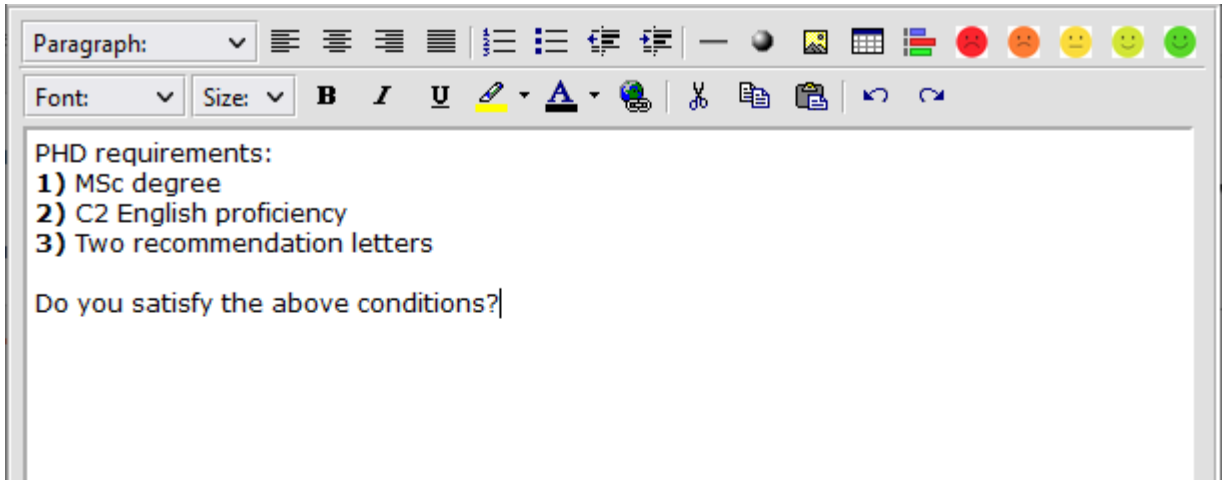
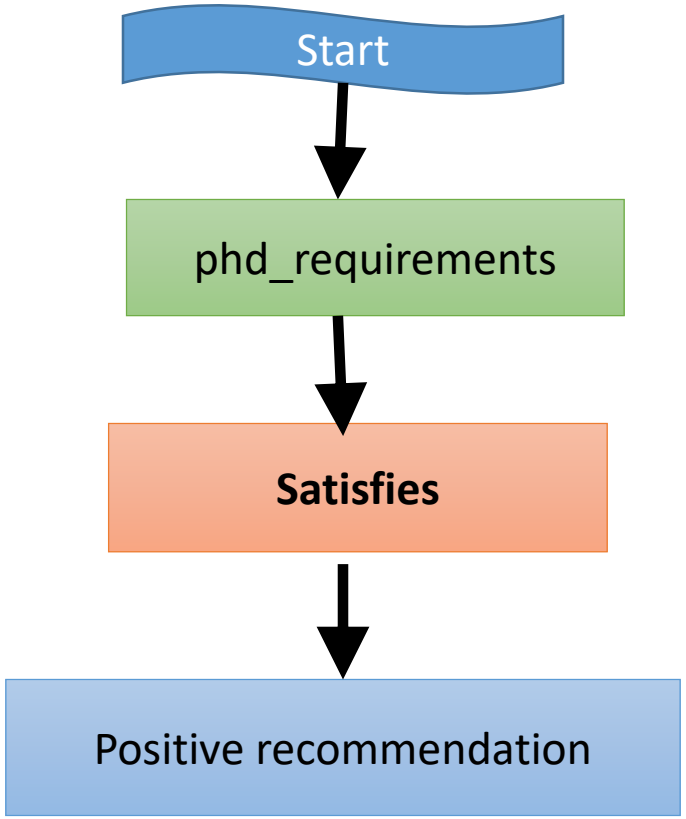
Ruleset examples

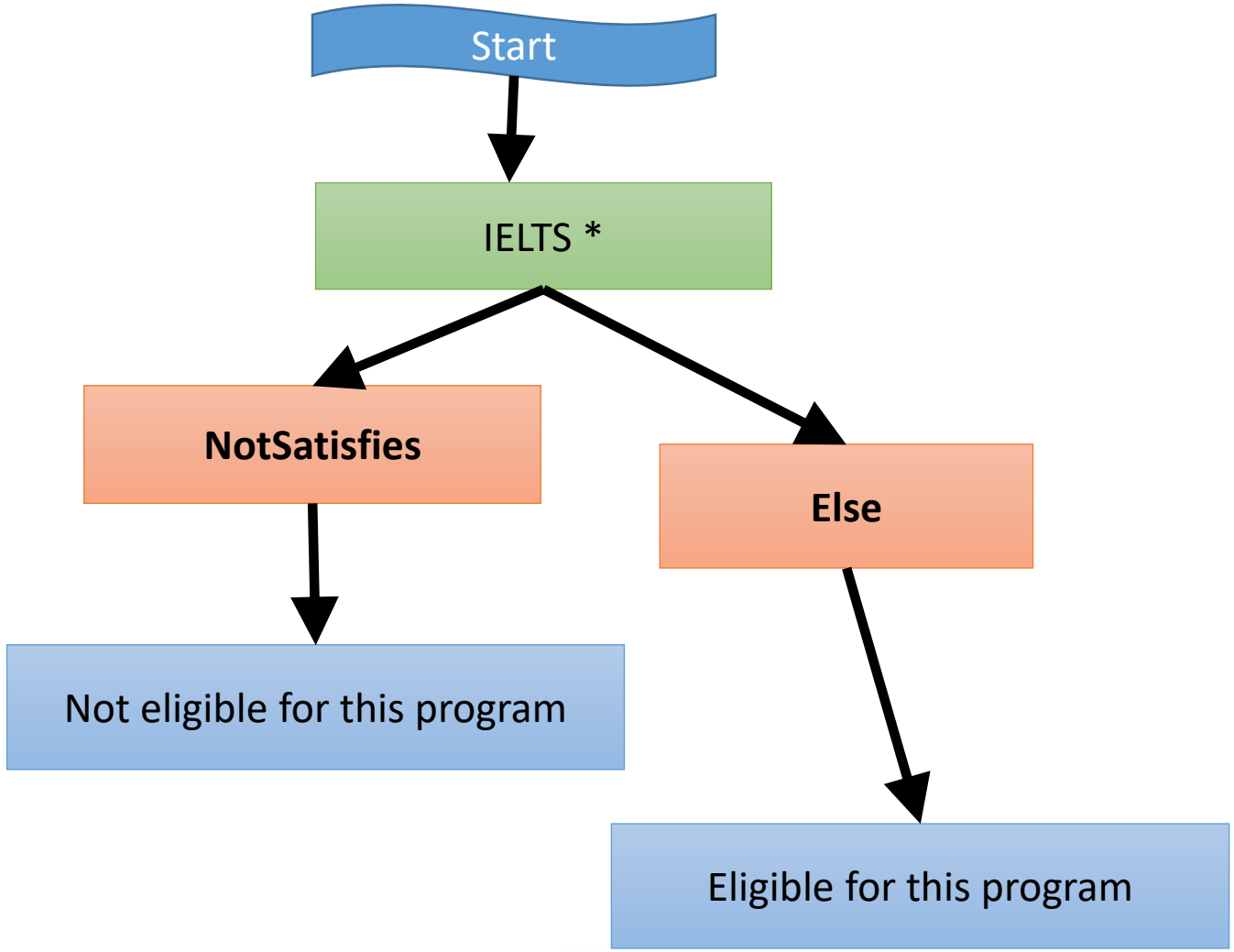
13. Add a new ruleset. Create a rule using the "satisfies" property which will show the message "Positive recommendation" for students that satisfy the criteria as displayed in the figure





Ruleset examples

14. Add a new ruleset. Create a rule using the “NotSatisfies" property which will show the message “Not eligible for this program" for students who do NOT hold an IELTS certificate with a grade of 7 or higher and an “Eligible for this program” message otherwise.



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3. Hands-on practical exercises to explore simple get-to-know exercises

Instructions

1. Please open the following quiz:

https://forms.office.com/r/tEvpsBjYjC

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A European University Alliance
invest
The Competitive University for a Sustainable Society

Instructions

Please open the following quiz:
https://forms.office.com/r/bf4tWXmBNe

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Hands-on practical exercises to explore real-life scenarios

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Instructions

Please open the following quiz:
https://forms.office.com/r/eGa9he6XGk

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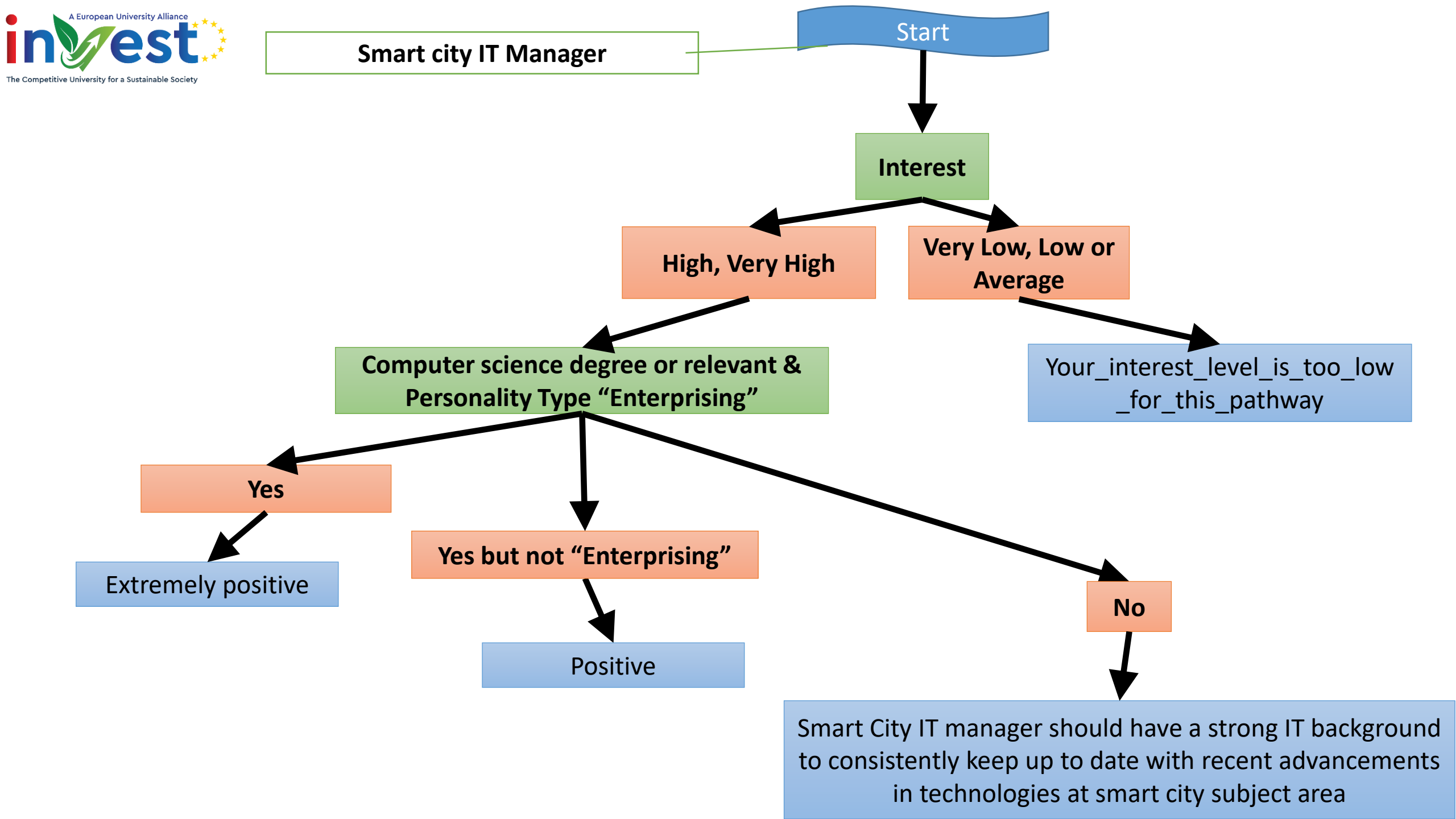
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Smart city IT Manager
Start
Interest
High, Very High
Very Low, Low or Average
Computer science degree or relevant & Personality Type “Enterprising”
Your_interest_level_is_too_low_for_this_pathway
Yes
Extremely positive
Yes but not “Enterprising”
Positive
No
Smart City IT manager should have a strong IT background to consistently keep up to date with recent advancements in technologies at smart city subject area

Winter school decision tree

Artificial Intelligence to support regional sustainable development

Onet Profiles:

- Sustainability Specialists
  - https://www.onetonline.org/link/summary/13-1199.05
- Computer and Information Research Scientists
  - https://www.onetonline.org/link/details/15-1221.00

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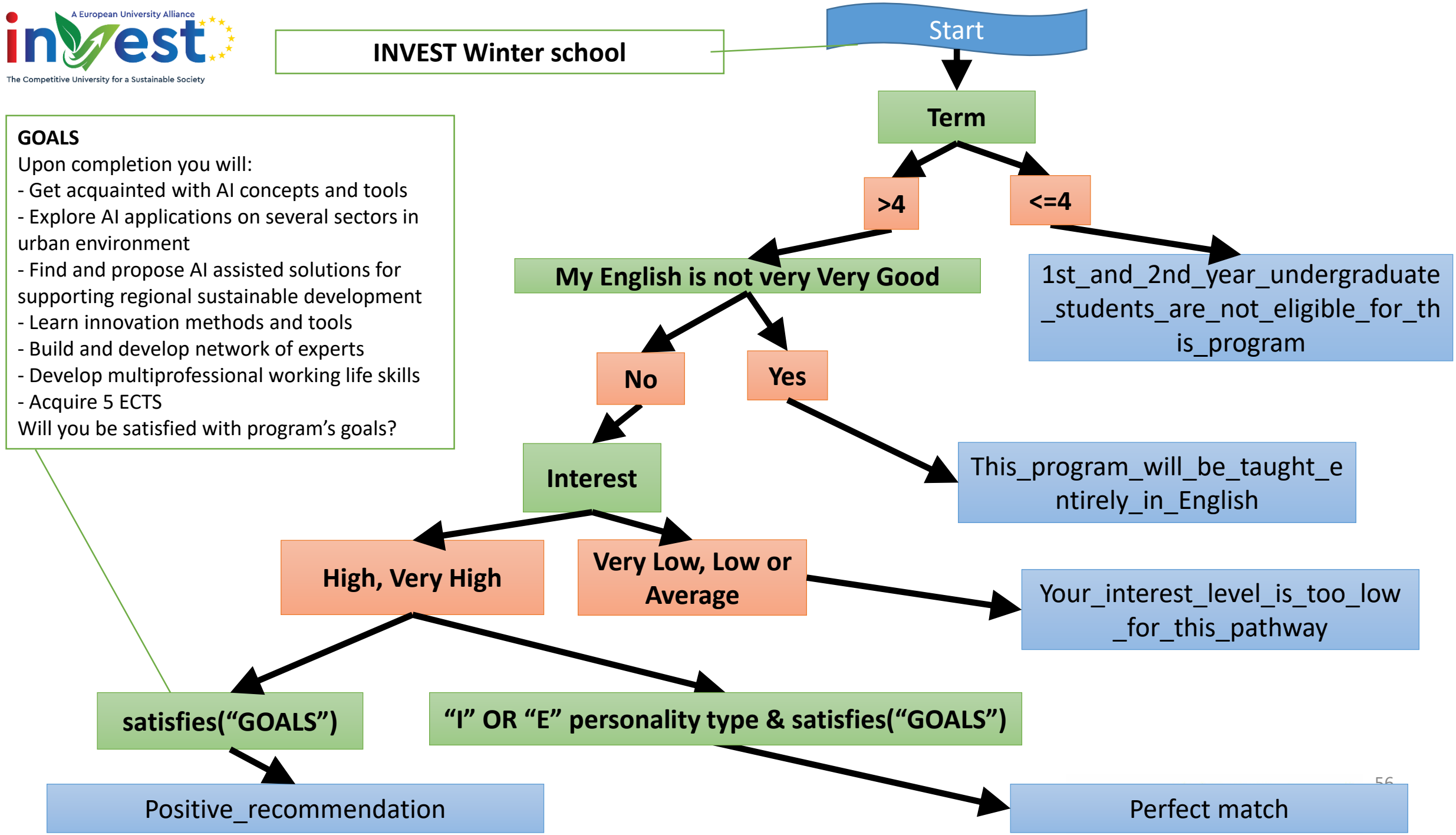
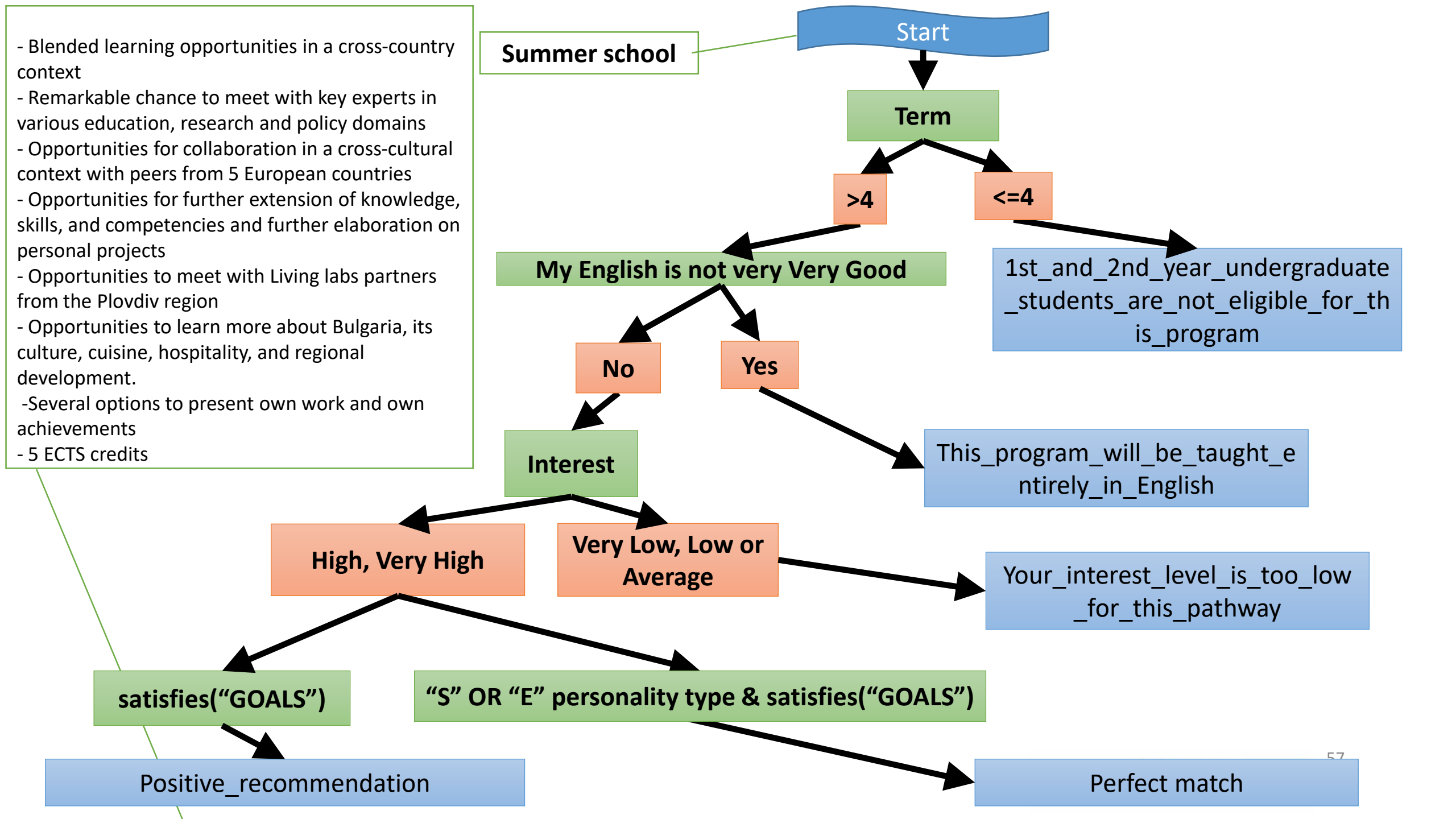
INVEST Winter school

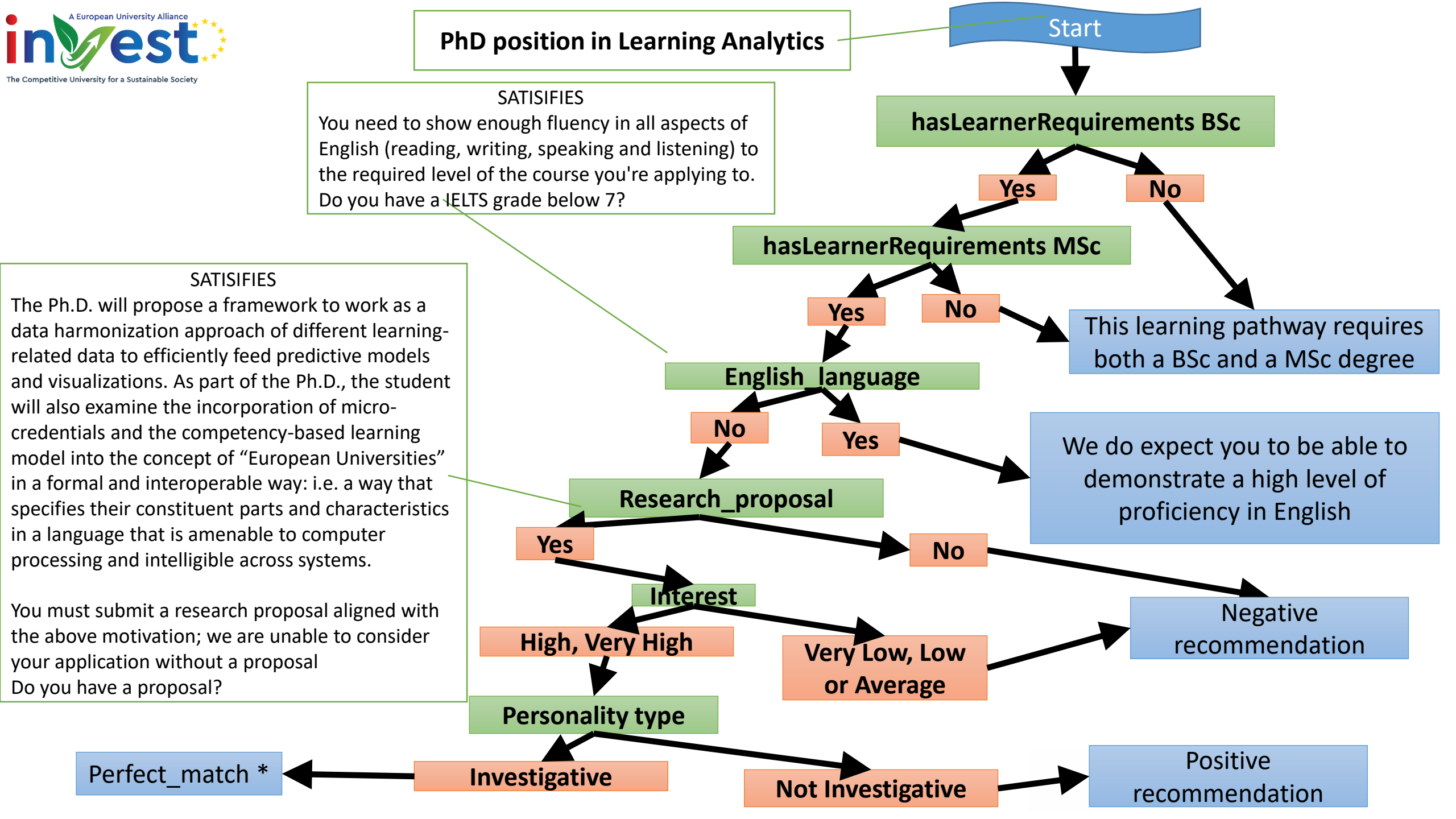
GOALS
Upon completion you will:
- Get acquainted with AI concepts and tools
- Explore AI applications on several sectors in urban environment
- Find and propose AI assisted solutions for supporting regional sustainable development
- Learn innovation methods and tools
- Build and develop network of experts
- Develop multiprofessional working life skills
- Acquire 5 ECTS

Will you be satisfied with program's goals?



- Blended learning opportunities in a cross-country context
- Remarkable chance to meet with key experts in various education, research and policy domains
- Opportunities for collaboration in a cross-cultural context with peers from 5 European countries
- Opportunities for further extension of knowledge, skills, and competencies and further elaboration on personal projects
- Opportunities to meet with Living labs partners from the Plovdiv region
- Opportunities to learn more about Bulgaria, its culture, cuisine, hospitality, and regional development.
-Several options to present own work and own achievements
- 5 ECTS credits

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PhD position in Learning Analytics
Start
hasLearnerRequirements BSc
Yes
No
hasLearnerRequirements MSc
Yes
No
This learning pathway requires both a BSc and a MSc degree
English_language
No
Yes
We do expect you to be able to demonstrate a high level of proficiency in English
Research_proposal
Yes
No
Negative recommendation
Interest
High, Very High
Very Low, Low or Average
Personality type
Perfect_match *
Investigative
Not Investigative
Positive recommendation
SATISIFIES
You need to show enough fluency in all aspects of English (reading, writing, speaking and listening) to the required level of the course you're applying to.
Do you have a IELTS grade below 7?
SATISIFIES
The Ph.D. will propose a framework to work as a data harmonization approach of different learning-related data to efficiently feed predictive models and visualizations. As part of the Ph.D., the student will also examine the incorporation of micro-credentials and the competency-based learning model into the concept of “European Universities” in a formal and interoperable way: i.e. a way that specifies their constituent parts and characteristics in a language that is amenable to computer processing and intelligible across systems.
You must submit a research proposal aligned with the above motivation; we are unable to consider your application without a proposal
Do you have a proposal?

5

Q & A

Contact data

Any questions?

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