PoLiL

(Proof of Lifelong Learning)

ABSTRACT

There is a rising need for hands-on know-how and micro-credentials for skills. This need is addressed by a proliferation of e-learning platforms and online courses. The resulting diversity of e-learning environments forces students to move from one e-learning platform to another. Without a coherent certification system that connects the previous knowledge acquired across these disparate platforms, this creates various problems including the cold-start (a starting point that is generic to every student) and the unnecessary re-exposure to learning materials.

A typical certification is proof of learning achievement that shows a snapshot of a student's knowledge at a given time. In contrast, PoLiL certifies a constantly updated learning journey through a blockchain solution that connects learning activities data across disconnected institutions, organizations and platforms. This proposal introduces PoLiL and explains how to solve the problem of proof of lifelong learning.

WHY

- A typical certification (paper/pdf) is proof of achievement that shows a snapshot of a student's knowledge at a given time. In contrast, PoLiL shows (and certifies) a continuing (constantly updated) learning journey.
- A typical certification (paper/pdf) does not explain how and what the student learned to be certified. In contrast, with PoLiL the certification reflects the full learning journey, it is not an end of the process but rather the process itself.
- A typical certification (paper/pdf), becomes old/obsolete, after a certain amount of time. When the user is asked to be re-certified following an updated course, the studying process restarts, often from scratch, even if the materials are mostly the same. In contrast, PoLiL can update the old materials granularly and point the learners directly to them, making the re-certification an obsolete process.
- A typical certification (paper/pdf) quality is guaranteed by the brand/name/prestige of the company/institution that releases it. This kind of guarantee can be expensive and in some cases unjustified. In contrast, PoLiL shows all the materials learned, transparently clarifying the quality of the learning journey. It gives to economically disadvantaged students the opportunity to be assessed purely by their knowledge and not by the brand of their certification.
- Knowing the full learning path of the student also enables better learning tools that can better design students' personalised journey:
  - Students can skip steps because of knowledge confirmed from previous courses
  - A new student can avoid the cold-start problem because the system is informed by previous learning activities.

WHAT

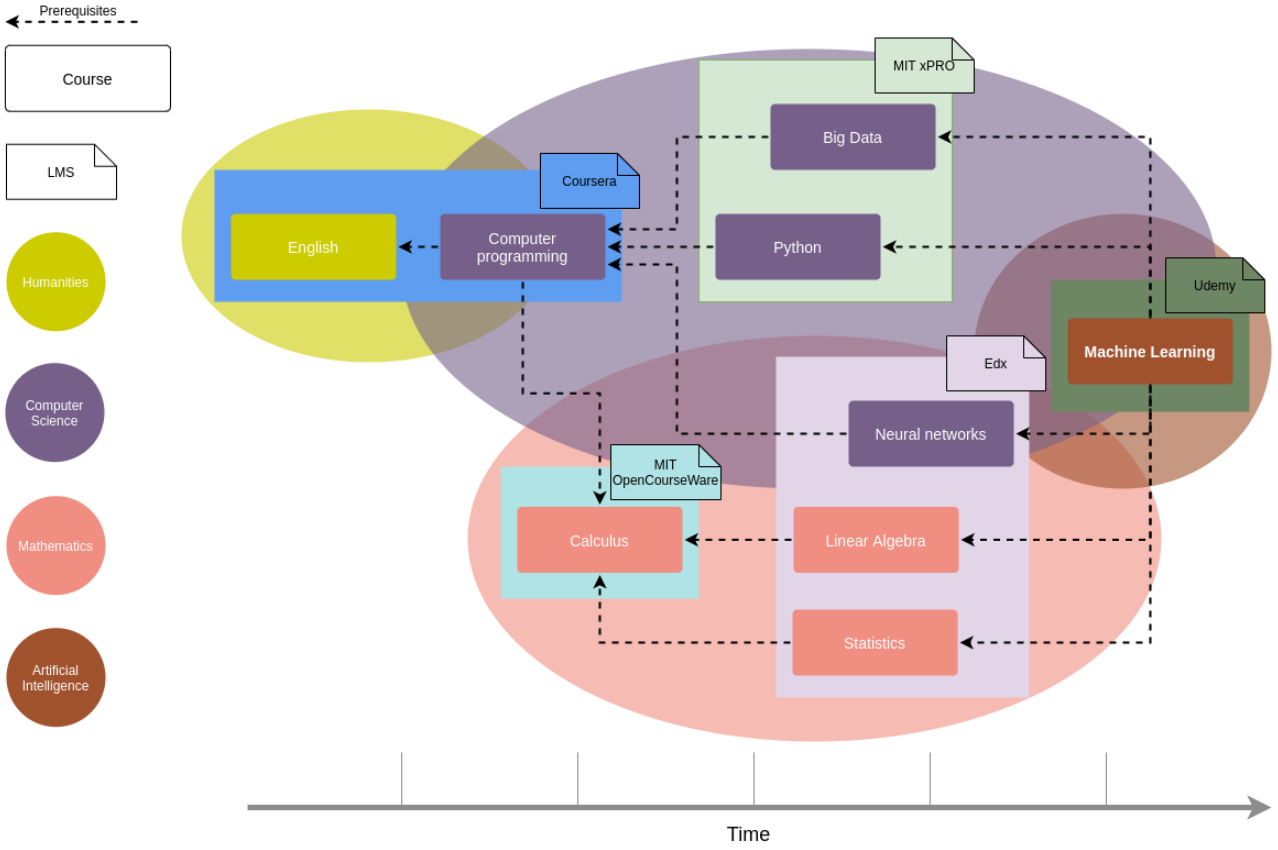
- A Learning Record Store (LRS) https://en.wikipedia.org/wiki/Learning_Record_Store is a data storage system that serves as a repository for learning records collected via the Experience API (xAPI) https://en.wikipedia.org/wiki/Experience_API
- Market-leading Learning Management Systems (LMS) like Coursera, Udemy, Edx, MIT xPRO, OpenCourseWare, etc. have millions of users and store millions of learning data activities in their LRS.
- PoLiL is a blockchain solution that connects learning activities data across LRS of different LMS owned by many institutions and organizations.

PROBLEM

- The LRS (owned by LMS companies) contains all of the user learning activities in isolated data silos. This data cannot be used by other companies/competitors, damaging the learner's knowledge progress. Data interoperability is precluded.
- The learner is the owner of their learning activities (and not the LMS company) but the value of this data is hidden because the attention is focused only on certification (paper/pdf) and not on the learning journey. Data portability is precluded.
- Every LMS company manages the data in its own way and even if compliant with restrictive regulations like GDPR, the learning data activities are not considered sensitive data. In reality, this data is very personal and must be protected. Data privacy is precluded.
- Inter-correlated didactic prerequisites in overlapping learning areas, delivered over time through siloed LMS, produce a slow, inefficient, high-friction and segmented learning experience.

  In this example (Figure 1), a certification in Machine Learning requires different knowledge acquired over time through different courses from different LMS. Because the systems do not talk to each other, the Machine Learning course starts without any information about the learner's pre-existing knowledge. This means a huge amount of material will be re-exposed to the learner or (even worse) taken for granted as existing knowledge.

Figure 1 - Inter-correlated didactic prerequisites in overlapping learning areas, delivered over time through siloed LMS

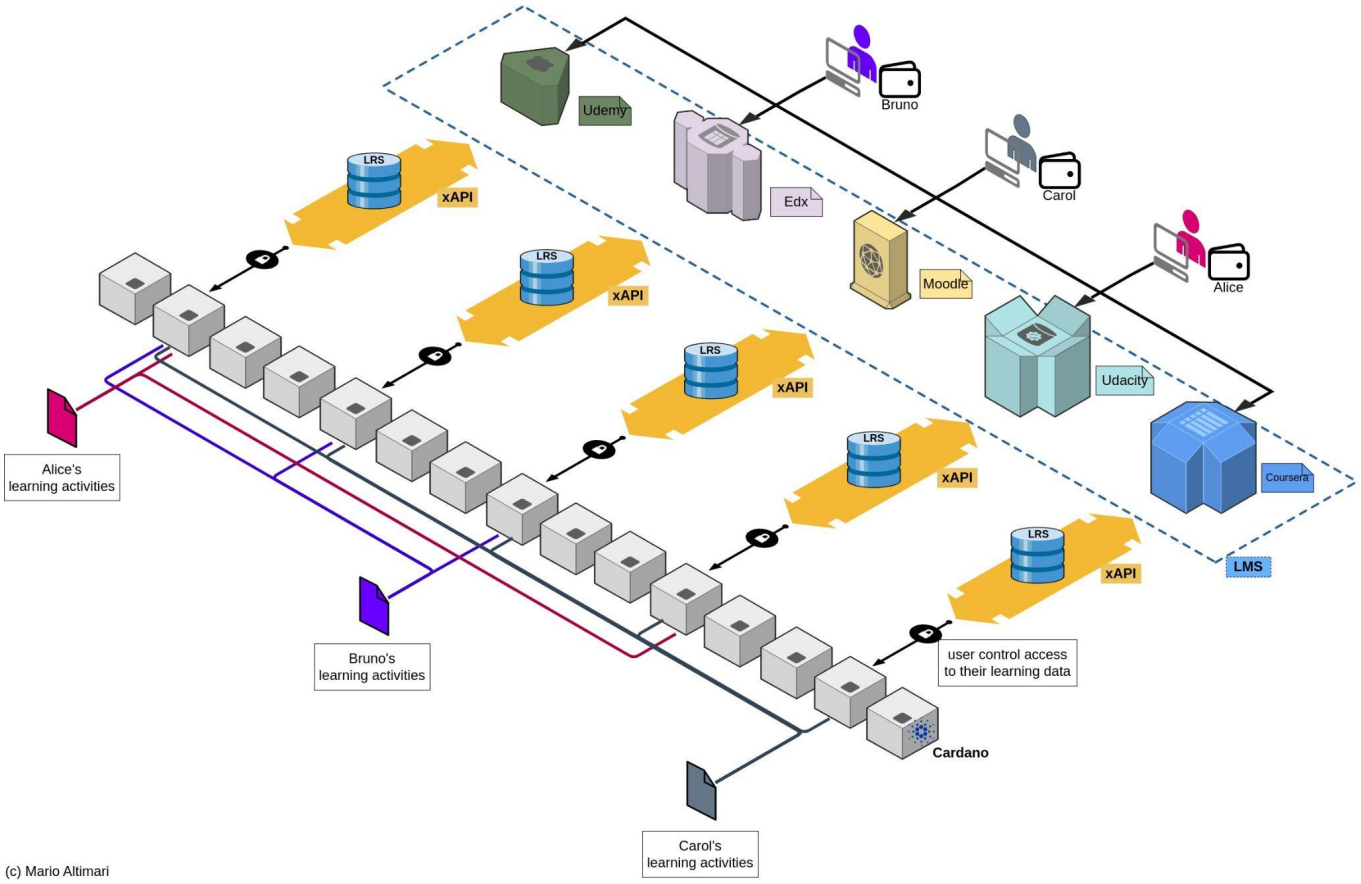


MARKET

- Learners buy the certification along the learning path they follow
- Display a certificate together with the full learning path has a cost.
  Parties who want to access a successful learning path of a specific student (e.g., potential or current employers) pay per view if authorised by the owner of the data (user).
- Users buy courses powered by PoLiL because they are more tailored for the learner's characteristics, context and needs.
- Because LMS companies are focused on certifying the completeness of the courses (which they sell in their huge catalogs), users prefer to buy courses powered by PoLiL because they are focused on quality and speed (as mentioned in the re-certification process) which cannot be matched by the mass market model of LMS companies.

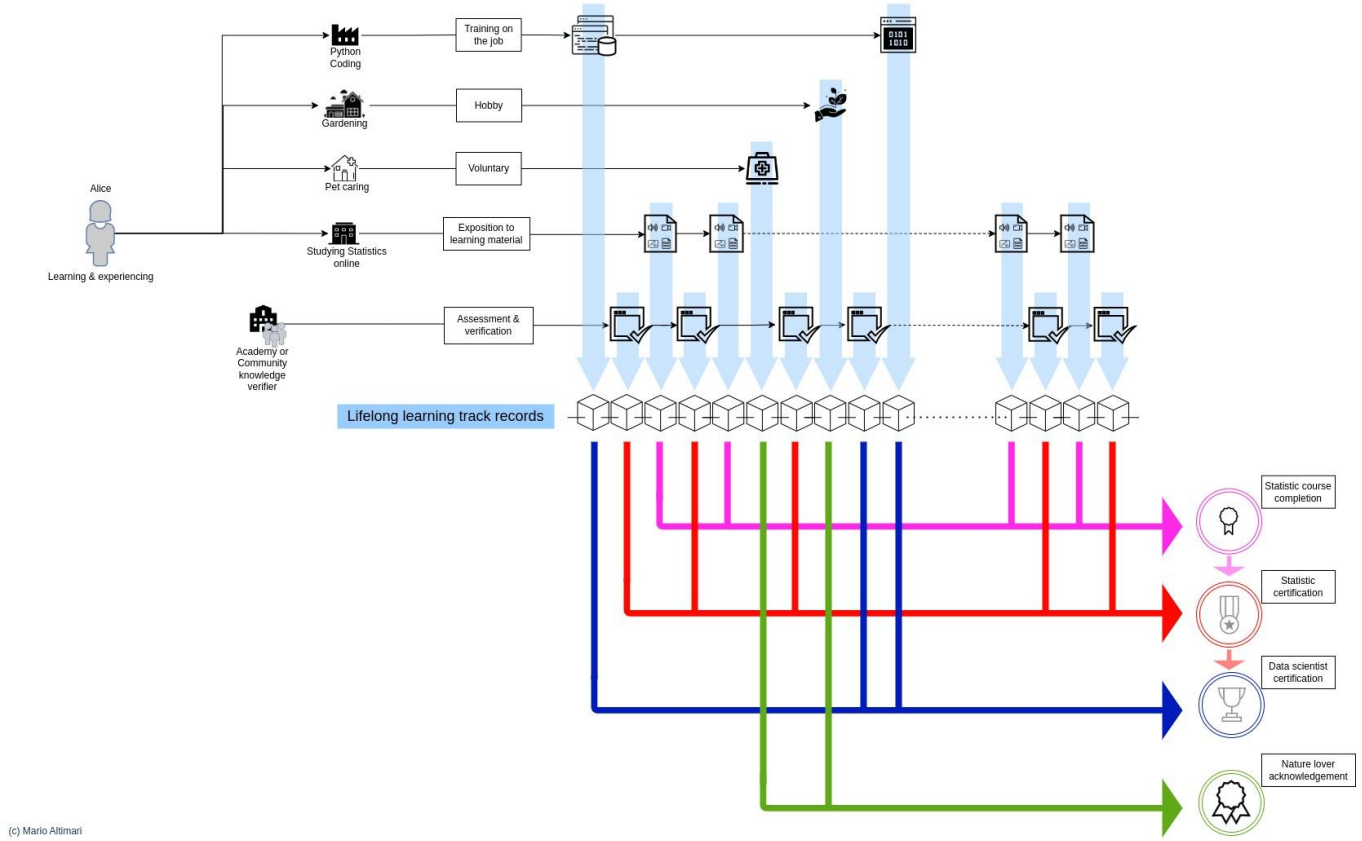
HOW

- Storing xAPI statements that describe the activities completed by the learner on a public/global blockchain, to create an immutable history of every user's learning journey.
  In this example (Figure 2) the learners Alice, Bruno and Carol access typical LMS like Coursera, Udemy, Edx, MIT xPRO, OpenCourseWare to take specific courses.
  Every LMS uses its LRS to read/store learners' activities, adopting the standard xAPI as it usually does.
  With PoLiL, the LMS on startup prompts the learner to grant access to their private activity records stored in the blockchain.
  When allowed, the LMS will also store the records of learners' current activities while taking courses.
  The PoLiL blockchain will contain the personal and immutable learning records of every single user. Alice, Bruno and Carol can access their personal data, anytime and everywhere, and show the certifications of their lifelong learning journey.



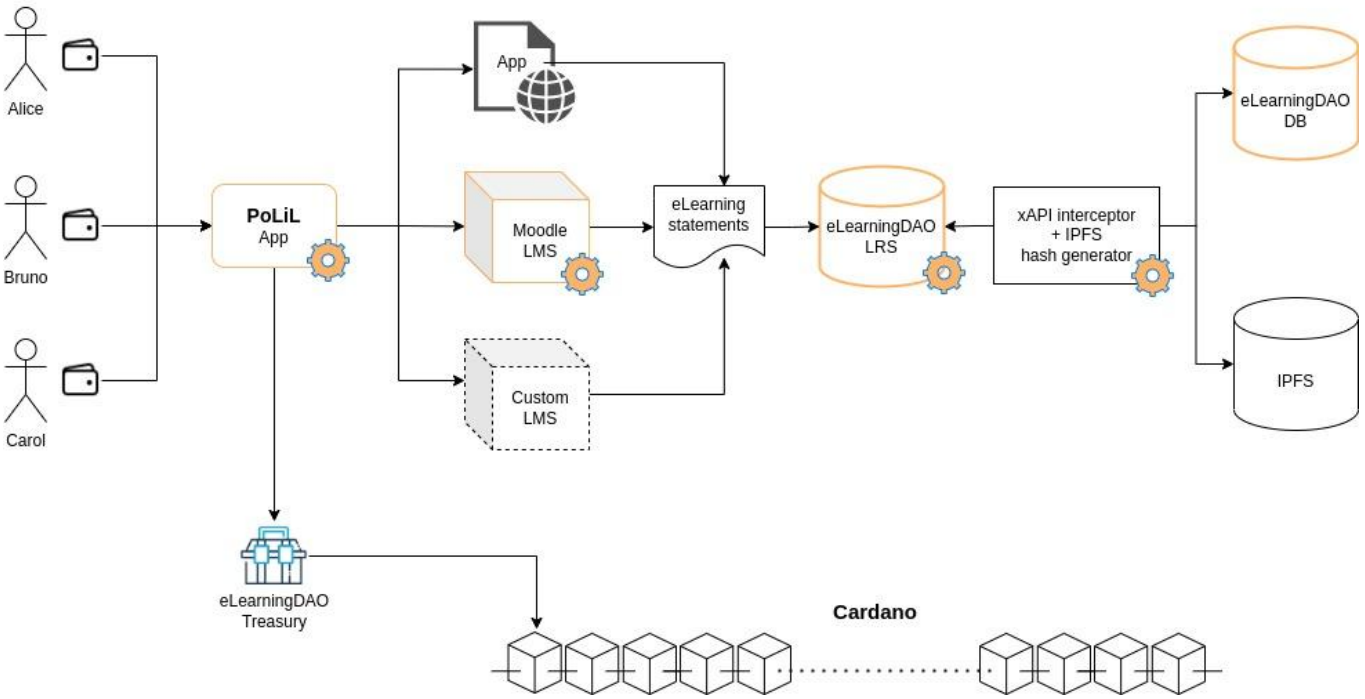
PoLiL

proof of lifelong learning that combines multiple disciplines and contexts



PoLiL App

component diagram
of the 1st implementation



IMPACT

We CAN achieve the reputation of curricula based on effective user learning data using the whole history of transactions, **instead of just relying on the brand/prestige of institutions** (public or private) as today we are used to doing.

A new kind of NEAR wallet will provide the tools for the learner to safely manage and share the learning journey as a certification in a visual and trustable manner, identifying the user by his/her learning journey.

In **Figure-1** example, a certification in Machine Learning requires propaedeutic knowledge acquired over time. Instead of having isolated certifications per "sub-knowledge" stored in the past, we will have:

- a unique proof of learning not fragmented across institutions and e-learning platforms
- a homogenous proof of learning unrelated by past "sub-certifications"
- an always available proof of learning public and immutable
- a personal proof of learning linked to user identity
- a learning process granularly updatable
- a never old, never expired, never obsolete, never deprecated certification, because the learning journey follows the user life

This project is not just an **open-source** solution free for everybody (private and business), but it is also compatible with the objectives of the **Sustainable Development Goals** (**SDGs**) of United Nations, a "*blueprint to achieve a better and more sustainable future for all people and the world by 2030"*.
https://sdgs.un.org/goals/goal4
https://en.wikipedia.org/wiki/Sustainable_Development_Goals
This proposal matches **Goal 4**. **Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all** and **4.4** By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

SOCIAL Key Performance Indicator (KPI):
• **Proportion** of youth and adults with information and communications technology (ICT) skills, by type of skill

• **Emulate** the learning journeys.
Can we be like someone we admire? Can we learn what our "hero" learned? we could go to the same university (if affordable) but are the courses, materials, assessments still the same? We can achieve it.

What if there is a platform like eToro that shows (instead of market data) the learning journey of scientists, academics, clever people, etc. that people can follow and emulate? Today teenagers are inspired by youtubers and tiktokers because they appear cool to their young eyes. Let's make things clear and show them what is behind the scene, behind the appearance.
The knowledge is less evident, it's intangible, let's show it. There is economic and social value there.

• **Equal** opportunities.
Assuming you want to be certified in "Advanced Management Program" from MIT, but you cannot be there because you live in Africa, especially **you cannot afford to pay** $65000 because you receive a salary based on the African market (by the way I can't afford it as well :-D), the job of your dream is precluded forever. But **what if there is a nice guy that publishes online all the materials where you can learn things and show your clever employer that your certification is equally comparable** (and maybe better if the community evolves it)? This stuff changes the world!

FINANCIAL KPI and potential Business Cases
• Revenue growth
New types of economic opportunities derive from the **monetisation of the "pay per view"** of the learning journey of specific talented users. Imagine if Alice wanted to know what Bruno learned to become a strong data scientist.

• Revenue per client
Or, if Carol the **recruiter of a company** wants to hire Bruno but he wants to be sure that Bruno went through a specific learning process. Bruno in these scenarios will receive monetary compensation from Alice, Carol and anybody else, every time someone accesses (after requesting and authorization) Bruno's trustworthy lifelong learning journey.

• Profit margin
Every time the learner updates the personal history of transactions with new learning materials, he/she could **micro-pay for the storage/network**, in this way the ecosystem is sustainable and incentivised.