LEAP powered by Intel® oneAPI AI Analytics Toolkit

Problem Statement : **Open Innovation in Education**

Team Name : C5ailabs

Team Members : Rohit Sroch, Sujith R Kumar, Mohan K Rachumallu, Shubham Jain

Problem Statement

MOOCs
(Massive Open Online Courses)

200K	380M	34.26%	5% -10%
Users in 2012	Users in 2020	CAGR 2022-27*	Completion rate

Key Challenges

- Lengthy videos
- Instructor Availability
- Slow response from forums
- No real time Q&A/Mentor

Approach

LEAP

(Learning Enhancement and Assistance Platform)

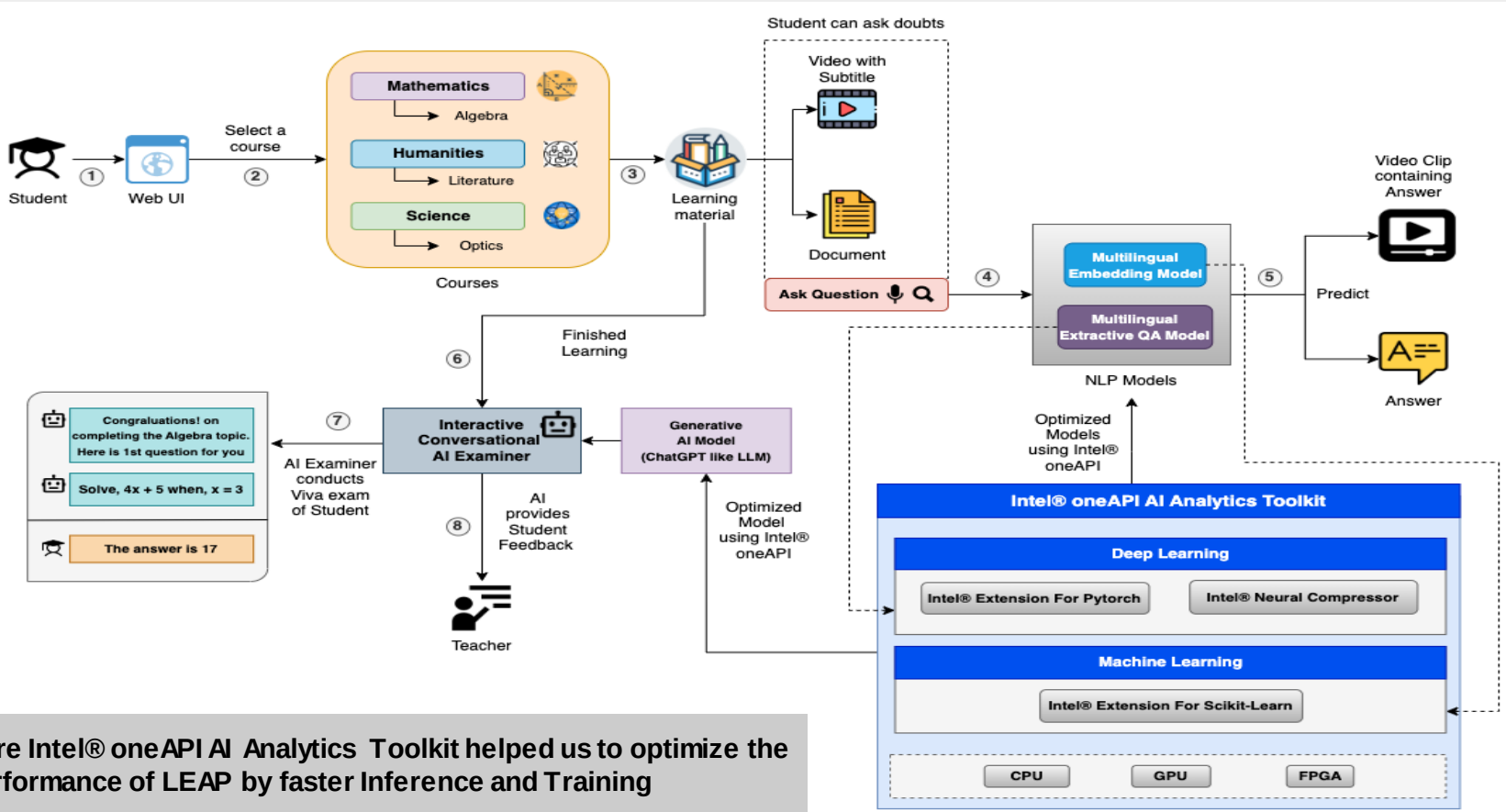
- AI based platform
- Powered by Intel OneAPI
- Quality Education
- All time Availability

Key Features of LEAP

- Ask Question/Doubt
- Conversational AI Examiner
- Feedback from AI Examiner
- Multilingual Support

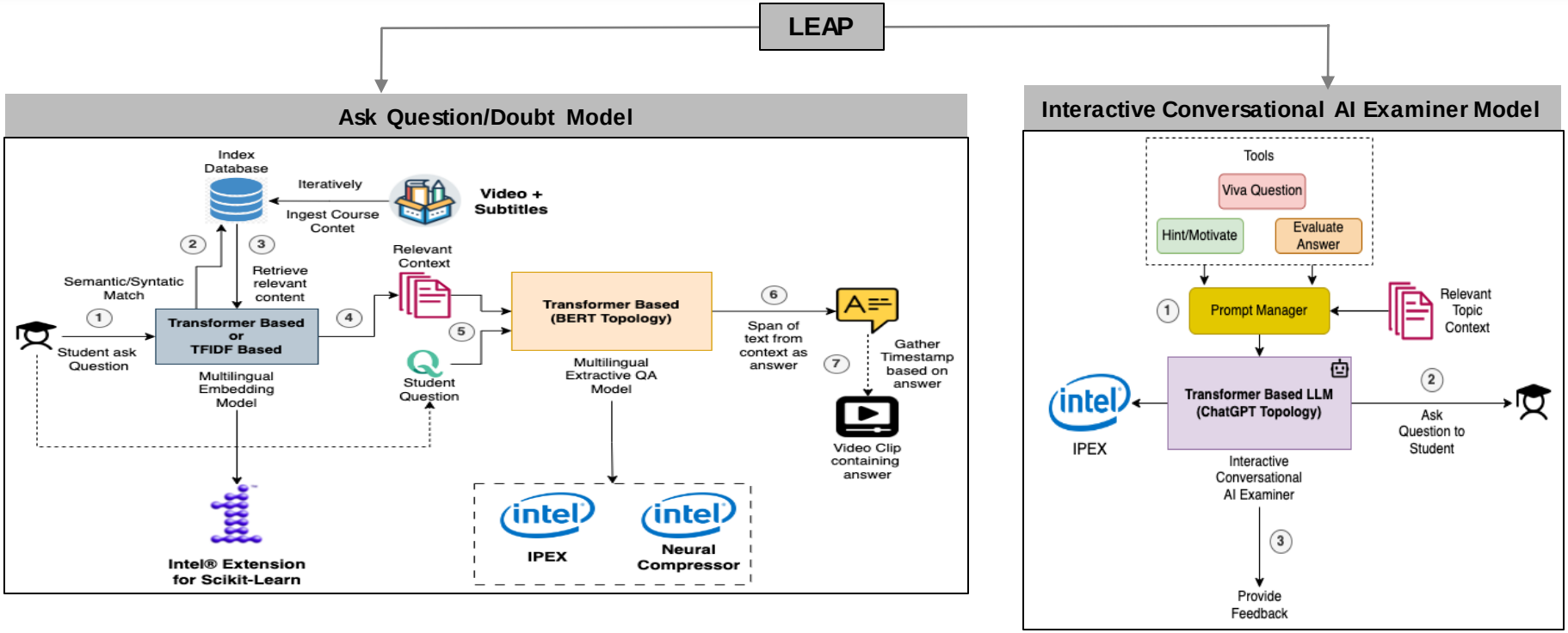
Reference: PRNewswire , Edtechreview; holoniq

High Level Architecture



Here Intel® oneAPI AI Analytics Toolkit helped us to optimize the performance of LEAP by faster Inference and Training

LEAP: Detailed Model Architecture Diagram for Both Components



Static-QAT-INT8 is 4.44x times faster in performance as compared to baseline For our Extractive QA Model

Ask Question/Doubt Model				
Extractive Question Answering Model				
	Pytorch (Base) - FP32	Pytorch (IPEX) - FP32	**Static-QAT-INT8**	Static-Smooth-QAT-INT8
Latency (milli sec)	64.513	39.329	**14.514**	15.24
Throughput (samples/sec)	15.501	25.427	**68.9**	65.616
F1 Score (SQuAD-v1)	**76.11**	**76.11**	75.72	75.72

Interactive Conversational AI Examiner Model		
TFIDF Embedding Model		
	Scikit-Learn (Base)	**Intel Extension For Scikit-Learn**
Latency (milli sec)	0.761	**0.752**
Throughput (samples/sec)	1313.63	**1330.49**

*Table: Latency/Throughput/Speed-Up Benchmark result for **our Extractive Question Answering ALBERT Model (Multilingual) and TFIDF Embedding Model** on Intel® Dev Cloud machine (**Intel® Xeon® Platinum 8480+ (4th Gen: Sapphire Rapids) - 224v CPUs 503GB RAM**) with optimization using IPEX-FP32, Static-QAT-INT8 using Intel® Neural Compressor and TFIDFVectorizer using Intel® Extension for Scikit-Learn.*

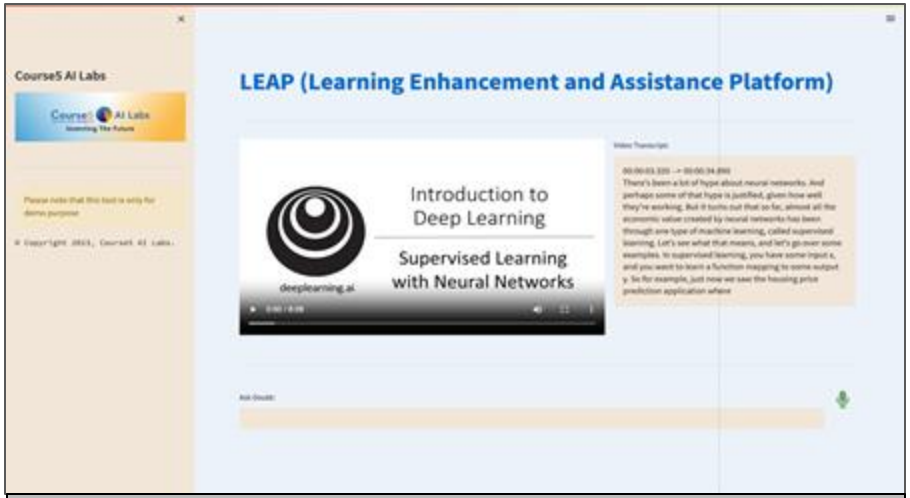
Demo Link and Screenshots

Link: https://www.youtube.com/watch?v=M51BFcoJa3k

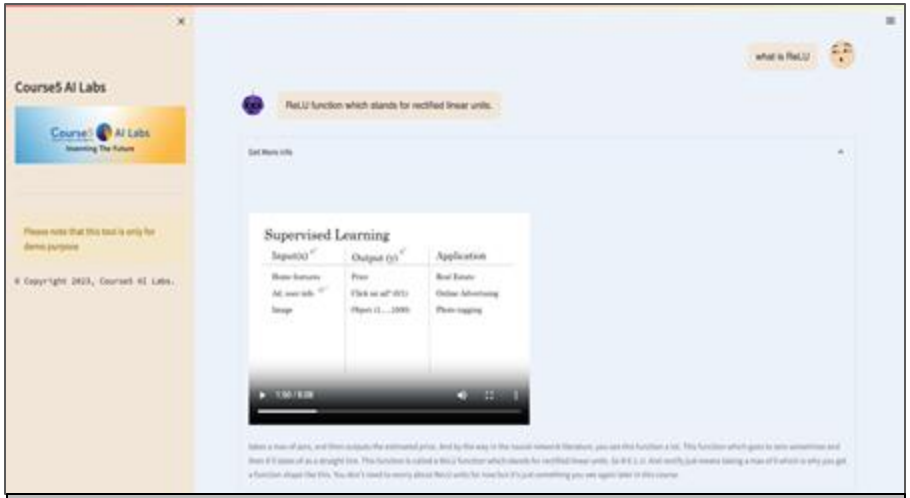
Screen-1 (Dashboard Page)

Screen-2 (Week wise Content Page)

Demo Screenshots



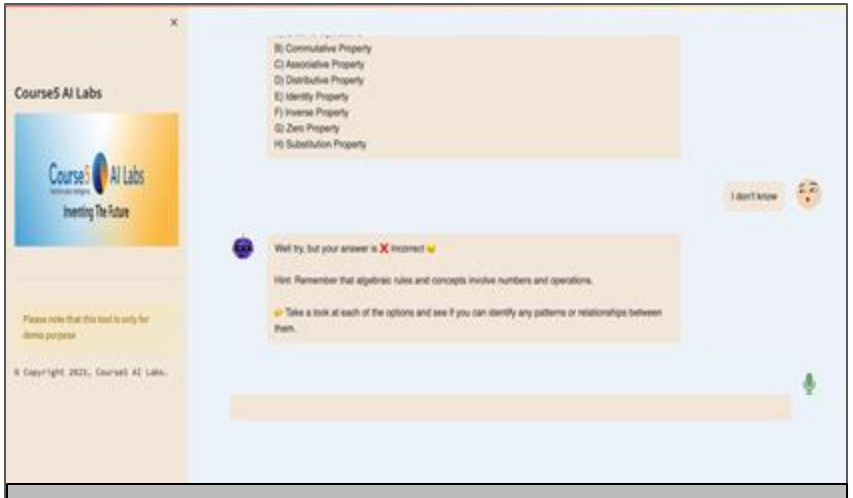
Screen-3 (Ask Question/Doubt Page)



Screen-4 (Ask Question/Doubt Page)

Demo Screenshots

Screen-5 (Interactive Conversational AI Examiner Asks Question to student)

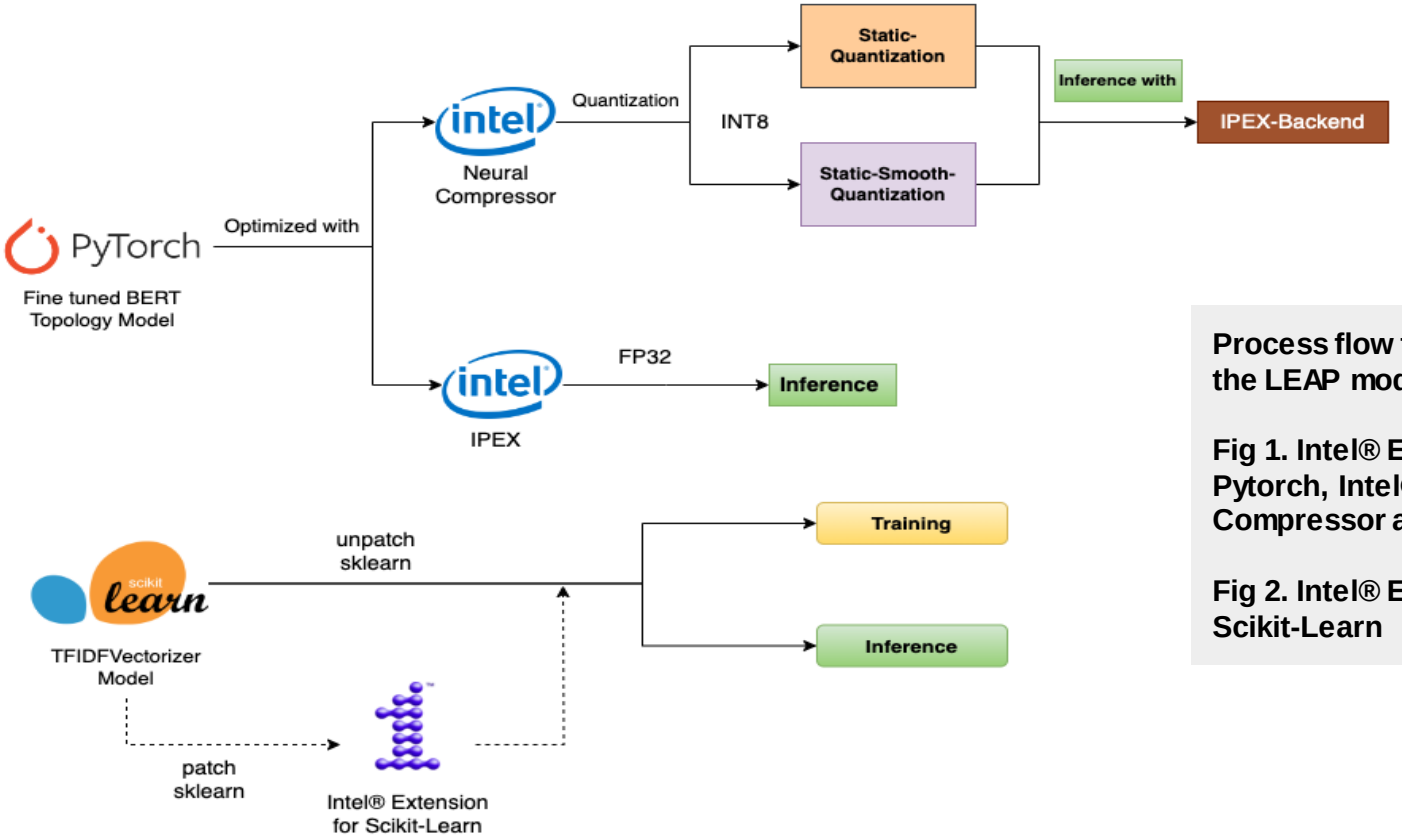


Screen-6 (Interactive Conversational AI Examiner provides hints and motivates a student in case of a wrong answer)

GitHub Link (Codes should be public and available after hackathon also)

https://github.com/rohitc5/intel-oneAPI

Result Summary (unique aspects of oneAPI/SYCL used)

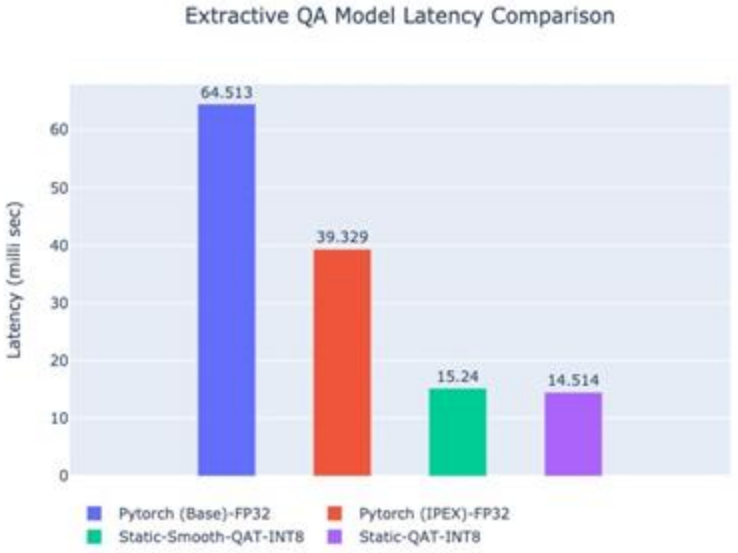


Process flow to optimize the LEAP models by using

Fig 1. Intel® Extension for Pytorch, Intel® Neural Compressor and

Fig 2. Intel® Extension for Scikit-Learn

Extractive QA Model (BERT Topology) Latency/Speed-Up Comparison with IPEX and Intel® Neural Compressor



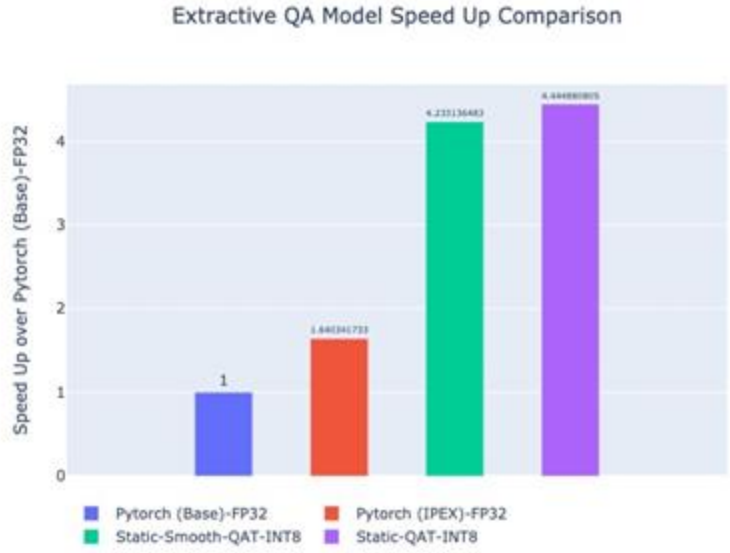
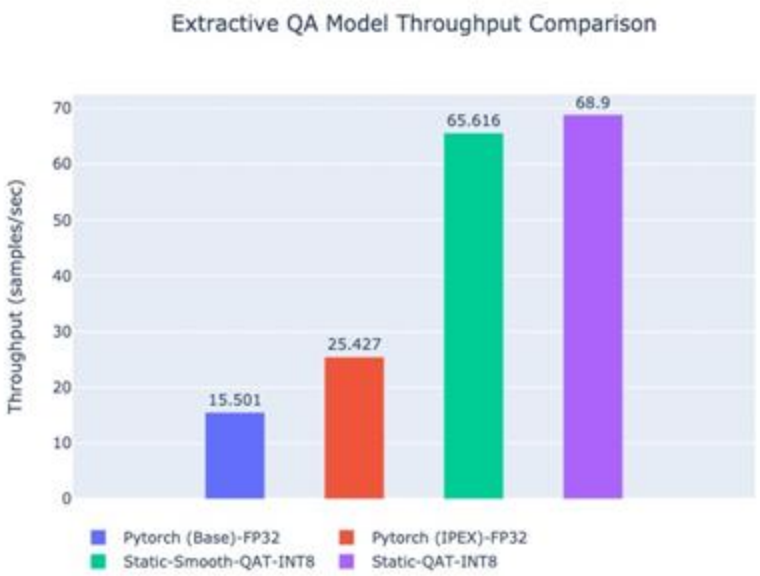


*Fig: Latency/Speed-Up Benchmark result for **our Extractive Question Answering ALBERT Model (Multilingual)** on Intel® Dev Cloud machine (**Intel® Xeon® Platinum 8480+ (4th Gen: Sapphire Rapids) - 224v CPUs 503GB RAM**) with optimization using IPEX-FP32 and Static INT8-Quantization using Intel® Neural Compressor.*

For Ask Question/Doubt Extractive QA Model

Extractive QA Model (BERT Topology) Throughput/F1 Score Comparison with IPEX and Intel® Neural Compressor



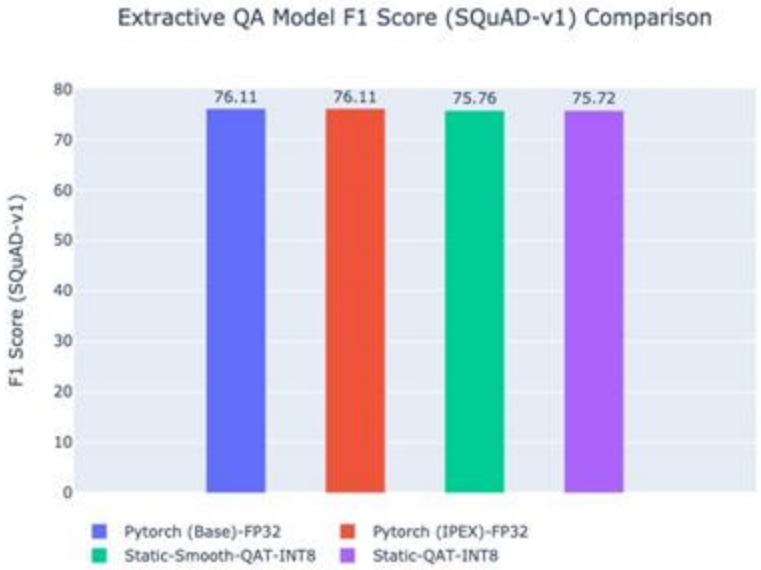


*Fig: Throughput/F1 Score Benchmark result for **our Extractive Question Answering ALBERT Model (Multilingual)** on Intel® Dev Cloud machine (**Intel® Xeon® Platinum 8480+ (4th Gen: Sapphire Rapids) - 224v CPUs 503GB RAM**) with optimization using IPEX-FP32 and Static INT8-Quantization using Intel® Neural Compressor. Also, the model (https://huggingface.co/ai4bharat/indic-bert) was fine-tuned on SQuAD-v1 dataset.*

For Ask Question/Doubt Extractive QA Model

Scikit-Learn (Base) vs Intel® Extension for Scikit-Learn

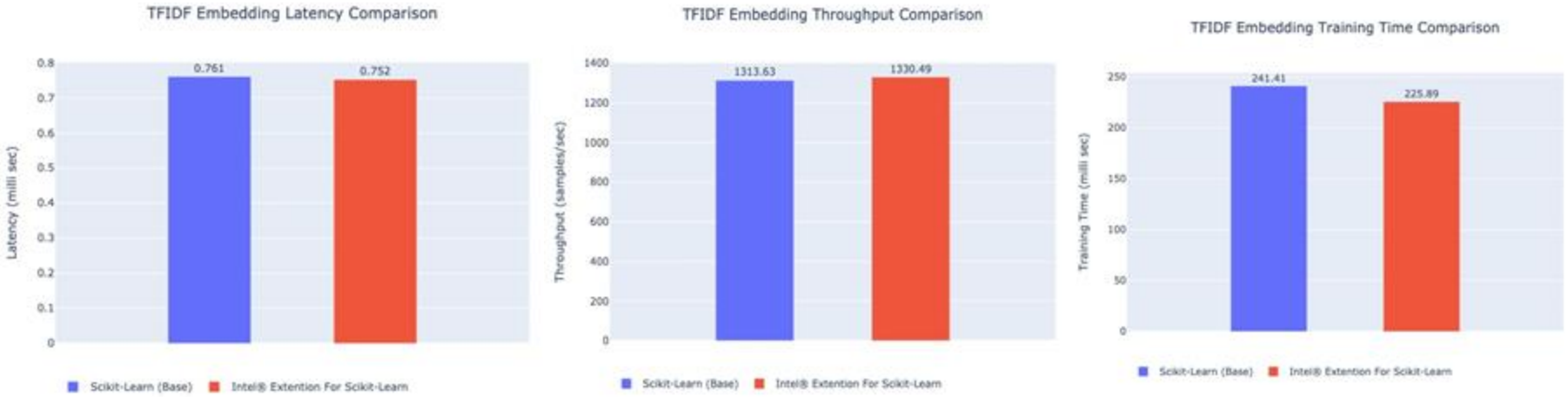


*Fig: Benchmark results for **TFIDFVectorizer** Embedding model during training and inference on Intel® Dev Cloud machine (**Intel® Xeon® Platinum 8480+ (4th Gen: Sapphire Rapids) - 224v CPUs 503GB RAM**). Please Note that we don't see much of a difference may be because we used a tiny dataset.*

For Ask Question/Doubt Embedding Model

intel. Model Checkpoint Release

https://huggingface.co/rohitsroch

H2S

intel

oneAPI

<HACK>ATHON

THANK YOU

Problem Statement

MOOCs (Massive Open Online Courses) have surged in popularity in recent years, particularly during the COVID-19 pandemic. These online courses are typically free or low-cost, making education more accessible worldwide.

Key Challenges

Online learning has become imperative to students. However, learning experience is not optimal, due to key challenges include:

1. To **sift through pile of lengthy videos** or documents to find relevant information
2. **Resolving doubts** can be a **time-consuming process**
3. **24x7 Teacher availability** for guidance

Objective

To mitigate challenges, we propose our **LEAP** (Learning Enhancement and Assistance Platform), which is an AI-powered platform designed to enhance student learning outcomes and provide equitable access to quality education.

Key Features

- Ask Question/Doubt
- Conversational AI Examiner
- Feedback from AI Examiner
- Highly Reliable