IT EXPRESS

WELCOMING NEW INSIGHTS

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

KATHMANDU UNIVERSITY

DHULIKHEL, KAVRE

IT
EXPRESS
2021

“A FRESH START”

Prof.MANISH POKHAREL, PhD

Dean, KU School of Engineering

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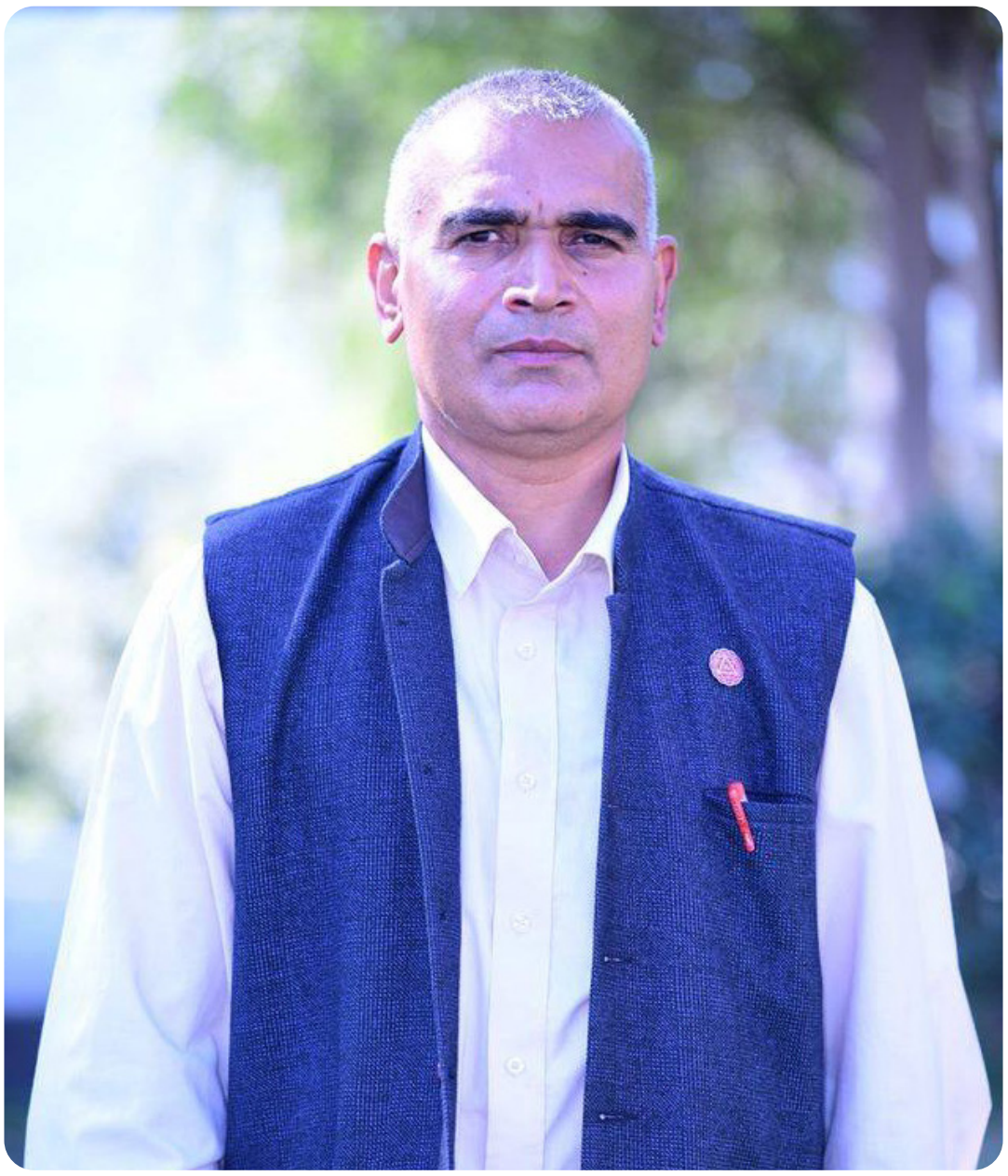
MESSAGE FROM THE DEAN, SCHOOL OF ENGINEERING

This is my pleasure to know that IT Express is going to publish soon with the effort of Kathmandu University Computer Club (KUCC). The KUCC is going to publish the new issue of the magazine even if we are in an unfavourable time of COVID-19. A big amount of work has performed into the development of this magazine and I believe that the audience will observe the effort reflected in this 2021 edition and in the impact it will have on the IT field.

As we look at IT Express, it is important to keep in mind that it represents the collective thinking of a group of innovative faculties and students who made contributions to this magazine. I am proud of editorial members and fortunate to be able to draw upon their individual and collective knowledge, talent, judgment, and disciplinary backgrounds to advance engagement. I am excited about what IT Express will add to our ability to communicate with broad audiences on matters of different areas of IT such as IoT, Big data, Industry 4.0 and AI. IT Express will be an innovative magazine providing a venue for scholarly works.

Finally, I want to thank our students, advisors and faculites who supported to publish this magazine. I look forward to our journey together as we develop IT Express to its fullest potential.



Prof. KANHAIYA JHA, PhD

Professor of Mathematics
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MESSAGE FROM THE DEAN, SCHOOL OF SCIENCE

It is my pleasure to write this letter of congratulations to the Department of Computer Science & Engineering and the Kathmandu University Computer Club (KUCC), a student club of the Department of Computer Science & Engineering, for publishing the new volume of IT Express 2021 by including inspirational and motivational as well as student's university-life experiences related articles. I am confident that this magazine would be informative and guidance to prospective students.

At the Department of Computer Science & Engineering, our students are the precious natural resources that we have. Their education is an investment in the future of the IT profession. Modern society is becoming more and more reliant on the use of technology, which has created a demand for IT experts. At Kathmandu University, our UNG programs like CE, CS, and CM, being headed towards IT, have become popular subjects of choice for the students. These programs are designed to cover both theoretical as well as practical aspects of knowledge. Along with it, our outstanding faculty members are working hard to prepare students for the future, which will bring further changes to software development. Thus, we are proud of the friendly relationships that students build with the faculty and staff.

I hope the department will continue to achieve its missions with the support of disciplined students, dedicated teachers, and cooperative staff to strengthen the status of our school.

I would like to congratulate the IT Express team for their hard work and dedication.

I wish all the best for the future endeavor.

DR. BAL KRISHNA BAL

Associate Professor
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MESSAGE FROM THE HEAD OF DEPARTMENT

It gives me a great pleasure to write for the IT Express magazine as the Head of Department of Computer Science & Engineering. In fact, the magazine has been able to establish itself as a unique platform for publishing various articles ranging from technical issues to academic and research based ones. Both the students and the faculties have been active contributors to the magazine. The magazine represents itself as a true face-value of the Department, so on behalf of the Department, I would like to encourage everybody to actively participate and contribute. In the days to come, we should be focusing more on publishing research based academic papers so that it becomes a platform for publication by academicians and scholars in the national and international level.

Publishing a magazine with this quality and richness is not easy. I can imagine the hard work and toil that the current team has taken. In this regard, I would like to thank the current team for its wonderful work and would like to express my best wishes for the timely publication of this edition.

DR. GAJENDRA SHARMA

Associate Professor

KUCC Advisor

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MESSAGE FROM THE ADVISOR

It brings me immense happiness knowing that Kathmandu University Computer Club (KUCC) is publishing the IT Express, our annual magazine, despite the current pandemic. Our students have taken the time and initiation to continue publishing this dear magazine of ours. And I hope that the online edition will inspire all of us to continue to share and uplift our passion for learning.

The magazine published by the Department of Computer Science and Engineering (DoCSE) every year provides us enthusiasts, a great insight into the latest developments in the field of computer science and technology. The articles authored by faculties and students always are exciting to read. My sincere thanks to all reviewers, editors, managing editors, contributors, and finally, the editorial board members for working tirelessly to bring this magazine to this stage.

Stay safe and healthy! We are all in this together.

AASHISH K.C

President of KU Computer Club
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MESSAGE FROM THE PRESIDENT

"Hope is a good thing, maybe the best of things, and no good thing ever dies." This line from Shawshank Redemption will never grow old and in fact, it holds true, now more than ever. Saying 2020 was a challenging year would be a massive understatement. Amidst the chaos, the only thing that kept us moving was the hope that it would get better, sooner or later.

In the middle of the pandemic, as lockdowns tightened, businesses halted and people were forced to be home ridden, the only thing that flourished was the online tech market. From entertainment sources like Netflix, games like Among Us, to online meeting platforms like Microsoft Teams and Zoom saw a soaring increase in their user base only proving how important it is to have such technologies to keep us together in today's world and to keep the world moving. Because like Einstein rightly put, 'Life is like riding a bicycle. To keep your balance you must keep moving.' And what better place to start your journey in technology, other than a university, as an undergrad tech enthusiast.

Kathmandu University's Department of Computer Science and Engineering as a whole tends to this task of grooming the future leaders in the field of technology. Kathmandu University Computer Club, being the departmental club, works hand in hand with the department and provides opportunities for students to showcase and enrich their leadership and technical skills as we conduct varieties of IT events and workshops. KUCC is proud to say that with the help of its sister community KU Open Source Community, and initiatives like KUCC Journal provides a platform for students to test their knowledge and skills. IT Express is no exception to that.

As an annual magazine, IT Express has served as a platform where students can contribute and showcase their creative and technical writing skills. Every year a lot of effort is put into it from getting articles to creating a beautiful magazine. I would like to take this moment to thank everyone in the IT Express documentation and editing team, design team and the IT Express Coordinator for making it all possible. I thank you for your work in shaping this magazine and bid you the best wishes for the success of the magazine.

Godspeed!

Meet the team

Coordinator

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III Year/I Sem

Editors

Diwas Shrestha
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Batch 2018
III Year/I Sem

Salina Koirala
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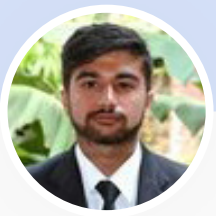

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Computer Science
Batch 2018
III Year/I Sem

Swornim Nakarmi
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Batch 2019
II Year/I Sem

Nirav Sapkota
Computer Engineering
Batch 2019
II Year/I Sem

Message from the team: IT Express 2021

> *Tell me and I forget, teach me and I may remember, involve me and I learn.*

Keeping this quote by Benjamin Franklin in mind, this year's initiative for the IT Express 2021 was marked.

IT Express, as said by many, is not an ordinary magazine. it reflects the skill shown by the editorial team, creativity crafted by the designers, and the link maintained and coordinated by the coordinator. Behind every year's successful release of the magazine resides intense hours of hard work and dedication showered by every individual involved as a member of the team.

Every year, this magazine is released with a variety of contents, which holds different insights. Following the same trend, we decided to keep the motto of this year's magazine to be **"Welcoming the New Insights."**

As marked by Henry Ford,

> *Coming together is a beginning,*
> *Staying together is progress,*
> *And working together is success.*

From advertising to designing the final magazine, everything was challenging. But, with profound dedication and holding a strong determination shown by each individual in the team, it was completed successfully on time.

With this, the masterpiece has finally marked its release.

Message to the readers!

Holding the originality along with quality, this year's IT Express has marked its release. Keeping our readers in mind, we have tried our best to bind the best of the best contents, so that whoever is holding this magazine enjoys the time they spend while reading it.

Meet the faculty

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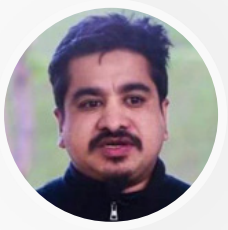

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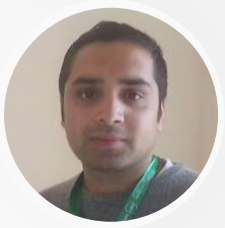

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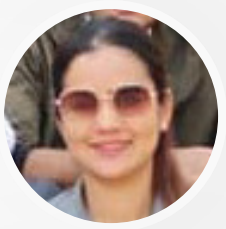

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Sagar Uprety

Vice President

Prabhat Neupane

General Secretary

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Treasurer

Salina Koirala

Club Secretary

Siza Adhikari

Executive Member

Aron Shrestha

Executive Member

Manish Bhatta

Executive Member

Nista Simkhada

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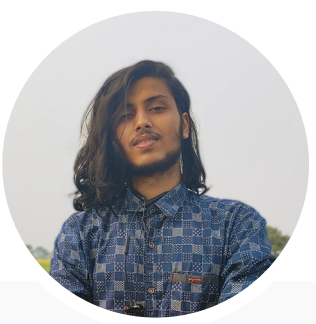
Executive Member

Anurag Timilsina

Executive Member



Kabin Bhandari

Executive Member

Aayush Pokharel

Executive Member

Communities under KUCC and their co-ordinators

Aashish Dhakal

KUOSC Co-ordinator

Awan Shrestha

Cloud Community

Arjun Bhandari

Dart Community

Utsav Prajapati

Game Development Community

Namit Adhikari

Python Community

Ashish Adhikari

IoT Community

Suyog Acharya

ML Community

Asmita Dhungana

Blockchain Community

Rashika Karki

Competitive Programming Community

Kushal Manandhar

Design Community

Aayush Dip Giri

Innovation and Entrepreneurship Community

Partha Chalise

Innovation and Entrepreneurship Community

Yogesh Pant

Design Community

Ashish Pokhrel

JavaScript Community

Niranjan Pant

JavaScript Community

Labs under DoCSE

ILPRL

Information and Language Processing Research Lab
Department of Computer Science and Engineering, Kathmandu University

The Information and Language Processing Research Lab (ILPRL) at the Department of Computer Science and Engineering, Kathmandu University was founded in the year 2004. The lab was found on the wake of the PAN Localization Project, http://panl10n.net, a multi-national localization Project that was conducted in 11 countries and 22 partners of South and South East Asia. Kathmandu University was a collaborating partner along with Madan Puraskar Pustakalaya (MPP) representing the Nepal Country component. The PAN localization project was a forerunner in the domain of Software Localization and Natural Language Processing in Nepal and the participating countries.

Projects:

1. NepaLinux Project [2004 -2009]
2. Dobhase Project [2005 – 2006]
3. E-Gov and Trust Issues [2010 – 2012]
4. Nepali OCR Project – Phase I [2016-2017]
5. Nepali Text-to-Speech (TTS) Project [2017-2018]
6. Popularity Tracking and Trend Analysis of Named Entities and Political Figures in News Media – [2017 – 2019]

DLRL

Digital Learning Research Lab
Department of Computer Science and Engineering, Kathmandu University

The DLR Lab was established in 2016 to pro- mote research culture in the university with following objectives:

- To promote online learning and e-learning pedagogy in higher education of Nepal.
- To develop online system to assist teachers and educators in professional teaching and learning.
- Empowering digital innovation in Education by using ICT.

Research Projects

1. Integrating Knowledge Management Techniques and HCI Principles for Effective Online Learning, funded by University Grants Commission (UGC).
2. Student Retention in Higher Education using Machine Learning Technology.
3. Implementing Data Mining methods in Online Learning System.
4. Study of Pedagogy in Online Learning System.
5. Identification of Online Learning Users in Online Learning System.
6. Developing MOOC on Scientific Research Writing, funded by Nepal Academy of Science and Technology (NAST).
7. MOOC for Higher Education in Nepal, funded by IDRC, Canada and administered by FIT-ED, Philippines under the theme “Digital Learning for Development (DL4D)”.
8. Enhancing Online Learning by implementing Knowledge Management Tools and Techniques.
9. Usability Evaluation of MOODLE in Kathmandu University.

Open Lab

Graduate Students (MTech. and ME) of DoCSE, batch 2018 developed a web application to address the Student Information Management for Kathmandu University. This project is a part of Software Engineering Course.

Project Details

Timeline: Jan-April, 2019
Project Status: Completed
Project Supervisor: Asst. Prof. Rabindra Bista, Ph.D.
Project Members: Aakash Bashyal(Project Lead), Subarna Adhikari, Ijana Kumpakha, Pramiti Munakarmi, Aarati Pandey, Prakriti Dhakal, Toshika Ojha, Roji Kayastha, Rojina Shakya, Birat Bade, Sanjog Sigdel, Arun Timalsina, Sahit Baral, Sabin Pahari, Ram Nath Pandit, Umesh Hengaju
Language: PHP7
Framework: Laravel5.5*, Vue, JQuery
Source Code: https://github.com/openlab-ku/KUSIMS/tree/V1

Features Implemented:

Following features are implemented in KUSIMS:

1. Login with Gmail Account
2. Creation of User
3. User Management(Roles and Permission provision)
4. Creation of School, Department, Course, Batch, Job Type, Employee & Program
5. Profile(Student, Admin & Employee)
6. Course Assignment
7. Addition of Subject Scores
8. Notice Publication
9. Adding Students
10. Hostel
11. Bus

Limitation and Future Works

1. Rigorous Testing to be Done
2. Project Deployment in Production
3. Each feature can be extended by discussing with the KU Administration.

Team has currently prepared a base system where one can plugin other necessary features of an Information Management System such as Library, Finance & Examination, End semester scores addition, GPA calculation.

The project source code is available on Github. Interested students can continue this project as their semester project and work on a small module. Or you can work on a new module and integrate it with the system as well. Feel free to consult Project Supervisor or email us at open- lab@ku.edu.np

DoCSE Alumni Association Web Application

Contributors at OpenLab are currently developing a Web Application for DoCSE Alumni Association. This project aims to provide a platform for faculties, students and alumni. Students can find information about Alumni, Alumni find information about fellow alumni and share different career opportunities which benefit each other.

Project Details

Timeline: March-July, 2019
Project Status: Ongoing
Project Supervisor: Assoc. Prof. Bal Krishna Bal, HoD, DoCSE
Project Mentor: Sanjog Sigdel
Language: PHP Framework: Laravel5.5*
Source Code: https://github.com/openlab- ku/DoCSE-Alumni

Application Features

Following are the features which were groomed during the project discussion meetings:

1. Student/Faculty/Alumni Login
2. Alumni's Profile(Batch, work experiences, skill set)
3. Event announcement by Faculty and Alumni
4. Email Notification Timeline

Call for participants was published in the last week of March. Four undergraduate students (2 from DoCSE & 2 from DoEE) applied for the project. Project discussion, grooming, and development began in April.

News and Events

Software Freedom Day

As a person working in the field of technology, who doesn't love to enjoy the use of free software? So, with the aim to increase awareness of free software and encourage its use, the Digital Freedom Foundation has been organizing Software Freedom Day every year on the third Saturday of September. Likewise, as the students of DoCSE, we wouldn't want to miss this auspicious day, so we celebrated this day by organizing a small event under the coordination of KUOSC, volunteers, and enthusiastic participants. On 19th September 2019, we celebrated its Eve in the library. On the following day, as part of the main event, we demonstrated the free software, discussed the importance of using high-quality FOSS in education, in government, at home, and in business at Block 9. The event was a huge success.

Report Writing

Before letting any student face their nightmares for the documentation work, enthusiastic seniors organized a small workshop that was focused on teaching the students of the 2nd Semester to write and prepare reports for their project. This event was organized on 11th August 2019 at Block 9, Room 304. At the end of this workshop, all the participants were confident about the report writing, formatting, and presentation for their semester project work

QT and SQLite Workshop

Every DoCSE student begins their journey with C and C++ programming languages. They have to do their first project using their knowledge of C and C++. To help the first-year students with their semester project, the duo of Ankit Karn and Bipin Acharya gave a small workshop on the topic 'QT' and 'Sqlite'. They provided the background and introduction of this topic. They even helped the students get a good grasp of the project structure with the development environment in QT.

Python Workshop

Python is undeniably the most renowned and one of the top-rated programming languages. Keeping this in mind, the presenters, Namit and Utsav, organized a small workshop under the Python Community. They started by providing the basics of Python and helping the participants get familiar with the fundamentals. The workshop was conducted at Block 9 and concluded with the Q&A session to clear out the queries of participants.

Node.js Workshop

Wherever we go, we come across websites. Seeing the high demand of these rising needs of websites and knowledge on its components, the Javascript Community organized Node.js Workshop at Block 9. The presenter Aseem Regmi made sure to start the workshop by familiarizing the participants with the basic concepts and completed the workshop by constructing a simple web server with the help of Node.js.

Game Development Workshop

Everyone enjoys playing games, be it indie platformers or AAA open-world adventures, and many of us have wondered how they are made. Some even would want to make a game of their own. So, the two-day workshop was organized with a focus on basic programming in 2D games. Bipin Acharya and Sanskar Chand headed the workshop with the help of Brajesh Raj Kayastha and Anil Kumar Shrestha on 27th and 28th November 2019.

Animation & VFX Workshop

The animation and VFX workshop was organized at the Neosphere office, New Baneshwor, on 20th December 2019. With the objective to provide ideas about basic animation and VFX and the use of Cine3D software, the workshop was presented by Pravin Rimal with the help of Bhumi Malla, Bisheshwor Bhatta, and Prajwol Lamichhane.

AWS Cloud Computing Workshop

The high market demand for cloud computing is no secret. To familiarize students with the concept of cloud computing, AWS trainers from Genese Cloud Academy conducted a workshop in collaboration with KUCC. Since the targeted audiences were the beginners, the workshop covered the demonstration of Cloud computing with AWS, an introduction to AWS, its activation description, a VM host creation, and teaching participants to host their web application. Participants were provided with AWS subscription to access Azure Portal on-premise.

Linux Talk

Linux Talk is an annual event organized by KUOSC and targeted especially to freshers of DoCSE. The main objective of this event was to familiarize the participants with the Linux operating system. Aashutosh Aryal, Ashish Pokhrel, Ashish Pokhrel, Bibatshu Thapa, Bibhushan Baral, Sanskar Chand, and Anil Kumar Shrestha presented the event with the help of Aashish Dhakal on 10th and 11th of November, 2019. Participants were assisted in installing Linux based OS into their computers and were acquainted with basic Linux commands.

Entreprenerds' Tales v2.0

A path from being a student to an entrepreneur is never an easy one. But as Walt Disney fairly said, "If you can dream it, you can do it." The secret of getting ahead is getting started and to encourage the start, the Department of Computer Science and Engineering with the support from Kathmandu University Computer Club, Department of Computer Science and Engineering, and Department of Management Informatics and Communication organized a talk event called "Entreprenerds' Tales" on 28th July 2019. This year, the event was based on the theme "Leadership and Technology in Entrepreneurship" where entrepreneurs shared their experiences and journey to success. Various discussions and Q&A sessions were held by the speakers of the event – Bobby Basnyat (Co-founder at Semantic Creation), Kim J. Baaden (CEO at Plus Leader), and Assistant Professor Rupesh K. Shrestha (Co-Founder at Idea Studios). Around 50 participants were present in CV Raman Auditorium and found the event to be extremely encouraging and helpful.

Demonstration of Linux Terminal Server Project (LTSP)

On the occasion of National Science Day, the School of Science organized a one-day fair in IT Park, Panauti, Kavre on 16th September 2019 where six volunteers from KUCC demonstrated Linux Terminal Server Project and explained how it works. Intending to provide basic knowledge on Linux Operating System and LTSP, they also illustrated programs like Kalzium, Gbrainy, Omnitux, etc. to the school students, teachers, and other 150 audiences present in the fair. They introduced LTSP as an affordable alternative to Windows for schools and public places.

Alumni Talk Series

KUCC took the initiative to launch a talk series with the alumni of the Department of Computer Science and Engineering. Utilizing the lockdown period, KUCC came up with various insightful topics to be discussed in the live session with alumni. The first three episodes of the series were conducted on 8th April, 19th April, and 22nd April 2020. Yogesh Bhandari facilitated the sessions with our guest speakers on Google Meet and projected them live via KUCC's Facebook page.

For the first episode of the series, we had Shakar Bhattarai, an aspiring programmer and a Software Engineer at Rakuten. He joined us and shared his insight on the gap between the theoretical knowledge we acquire at the university and the practical skills we require for the IT industry. After that, we had Bobby Basnet, entrepreneur and co-founder of Semantic Creation, joining us for a live session to share his journey from being a student to starting his company. For the third session, we had Ashish Belwase, CEO of BTechnologies and the former technical lead at Help Nepal Network, joined us live to talk about emerging tech and freelancing in Nepal. Above 200 viewers watched the sessions live and found it to be informative and insightful.

Django Workshop Series

With the world dominated by the web, it is always a hustle for programming enthusiasts to choose a language or web framework they can rely on to grow as a programmer. Being a high-level Python web framework that enables the rapid development of secure and maintainable websites, Django has been one of the first choices for learners for years. To encourage the starters, KUCC organized a series of Django workshops targeted for beginners on 14th July and 28th July 2020. Aashish Dhakal started the workshop by giving a basic introduction to Django and MVT models and covered topics like Django URLs, migrants, Django admin, ORM, view, context, templates, etc.

Machine Learning Workshop

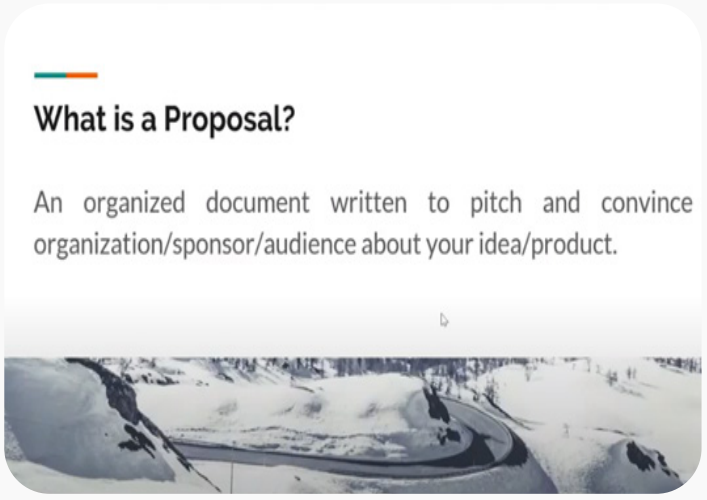
AI has made an impact on so many fields from businesses to applied physics. As a computer's student, knowing the basics of ML would help students understand the underlying algorithm easily. Different practical use-case algorithms were discussed on 3 different occasions within this year, of which two programs on 3rd December 2020 and 27th December 2020 covered basic knowledge on Machine Learning, its different types and application and that on 16th July 2020 was related to Natural Language Processing and Neural Networks.

Python Online Workshop

The trend of using python has been increasing, maybe it's because of its easy syntax and readability. KUCC organized an online session on 13th July to teach the basics of python and set up Python in different environments in various areas such as Web development, Machine Learning. Cloud Computing and others. The presenters also helped students know of python libraries and frameworks. Students were very interested in it and had engaging conversations.

Pacman Graphics Blender

A picture is worth a thousand words. In a one day workshop of Pacman Graphics Blender, participants were able to familiarize with different techniques for modelling, shading and rigging. It was organized on 28th November led by presenter Utsav Prajapati. He also focused on Animation techniques of Blender.

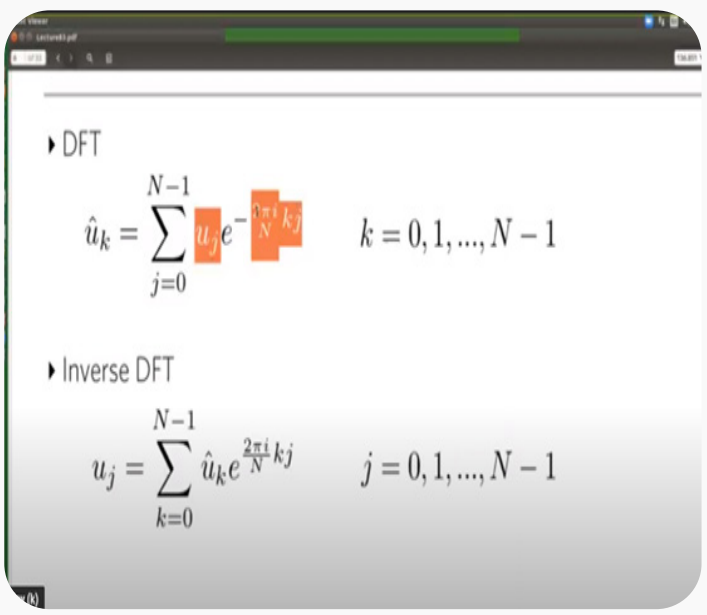


Proposal Writing Workshop

The need for writing proposals comes in different fields, in our Bachelor's program of the computer department, we have to write it after every six months for a project. Keeping this in mind, first-year students were given an opportunity to learn the format of DOCSE's proposal writing in detail. It was done on 30th June 2020 to familiarize students with its significance. The presenters also explained about plagiarism and citations on proposals and how they can be changed.

Git and Github Workshop

Presented by Sagar Uprety and Salina Koirala, the Git and Github workshop was held on 1st July 2020. As with most events held in 2020, this too was conducted online via google meet. It was aimed for first year students who were new to programming and working remotely for the first time. The participants were made familiar with basic git commands which would be helpful for them to collaborate on their projects in future. This was achieved with a live demo of Git and Github implementation in real projects.



One Week Supercomputer Workshop

The only supercomputer of Nepal is looked after by the Supercomputer Centre of KU. KUCC with the Supercomputer Centre of KU organized a week-long Supercomputer workshop from 19th to 20th of July, 2020. It was conducted virtually by Dr. Rajendra Adhikari with the help of Mr. Sarun Jonche and Mr. Shirshak Bajgain. It was targeted for students of all levels. They were taught basic commands of the supercomputer by accessing it remotely from their home.

Q&A
with Prof. Manish Pokharel, PhD

Prof. Manish Pokharel, PhD
Dean, School of Engineering
Department of Computer Science
and Engineering

Area of Interest
Digital Governance, SMART City, Internet of Things (IoT), Artificial Intelligence (AI), Cloud Computing, Big Data, Software Technology

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Interviewed by
Siza Adhikari and Salina Koirala

Q Taking the pandemic period as the reference, how would you describe the term "Education"?

A First of all, I have always described Education as a tool that is needed for equipping all the students with abilities to strengthen, to face the challenge, and even to grab the opportunity.

Taking this pandemic as a reference, I would like to highlight the problems first. The first and foremost problem is the Structural Shift, which brought us to the new concept of "Degree to Skill," and the second most problem would be to find the problem because if we are able to find the problem, the solution shall follow with it.

Taking all these things in mind, I would like to redefine Education as **"A mechanism to equip with Self-Learning which must be combined with Rapid Learning following the concept of Unlearning and taking adaptation, as well as Self-motivation, go hand in hand."**

Q Sir, as you totally changed the concept of Education by redefining it including the terms such as Self-Learning, Rapid Learning, Unlearning, Adaptation, tagging Self-Motivation with it. It indicates a paradigm shift, which means our market is demanding change. So what kind of change do you think the market is demanding?

A Yes, the market is demanding change. Especially facing these pandemics and the lockdowns, everything is reshaping.

The change that the market is demanding is being able to think in the long run with the focus on Deep Learning, Automation, IoT, and make it capable of merging everything with AI.

Q Speaking about the change, this pandemic has brought a new wave of change in many sectors, including the educational sector. What do you think about the effects that have come in the syllabus and teaching-learning process?

A According to research, approximately two billion students around the globe have been affected by this pandemic. So, this pandemic has indeed created a whole new wave of uncertainty and alternated our traditional teaching-learning system. But this alternation had to happen sooner or later. The way it happened was quite drastic, but I believe we should take it as a lesson and prepare ourselves for anything that might come our way.

Moving to the online mode of teaching and learning is a positive step. However, we should not limit it to this pandemic period. We need to develop a digital ecosystem where all the students will be able to utilize a synchronous and asynchronous mode of learning as well as be provided with the resources for revision through the recording. Online learning should go hand in hand with our traditional learning system in the future as well.

Q This pandemic is the new normal now. Having said that, it is also not easy for students to adapt everything that has changed around them. Would you like to advise us, the students, anything, regarding how we can adjust to this new normal?

A As I already mentioned earlier, while I was defining the term education, students need to acquire themselves with adaptability, self-learning, rapid learning as well as unlearning. One of the many lessons we got from this pandemic is that the future is uncertain. We can't plan everything. Planning things may not work in your favour every time, but the ability to adapt to new circumstances surely will. Don't restrict your brain to one particular thing. So my advice to the students will be, "Learn to adapt to anything that might come in your way."

Q Talking about the market, the IT market to be precise, where do you think is the IT market inclining? What can we expect from the IT industry in the future?

A I see the IT industry blooming vividly. We have a lot of potential in us. We now need to map these potentials for skills. We have already begun to witness the changes technology has brought to the world, and we will see them escalating from now on. We should not be surprised to see Artificial Intelligence, Cloud, and Smart technology dominating everything. Whatever we will be doing in the coming days, we must be able to merge everything with the AI.

Q&A
with Pankaj Raj Dawadi

Pankaj Raj Dawadi
Assistant Professor
Department of Computer Science
and Engineering

Area of Interest
Image processing and Computer Vision, Deep Learning, Media Technology

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Interviewed by
Diwas Shrestha and Sujan Nepal

Q How has the experience of Remote Working been?

A Honestly, it has been a great learning experience. In this pandemic situation, it has been an opportunity to implement technologies for both teachers and students. The remote learning situations allowed me to learn and indulge myself in more learning management systems such as moodle and google classroom.

Q What inspired you to get into the field of AI? Who has been your greatest inspiration?

A Initially, I learned AI during my Bachelor's Degree course in 2003, after which I pursued my Master's degree in Machine Learning and computer vision. It was here where I learned more about what AI was, different algorithms that we used in making AI and the implication of AIs.

As they say, " Books are the most accessible and wisest of counsellors, and the most patient of teachers", so after indulging myself more and more into books on and about this field, I became more interested in it.

Q Which innovation has astonished you the most this year? What research piques your interest and what are the latest interesting things being done?

A In dangerous conditions, technology can help a lot. So, Remote learning, and AI robots that took care of patients in this pandemic situation have caught my attention. Real-life application of AI links with different other domains such as IoT, cloud computing, big data and others which makes AI have so many subdomains and all of them are very interesting.

Nowadays, my interest has headed towards Smart Transportation using different image processing techniques for Computer Vision for my PhD. I also read a philosophical research paper about whether AI's could be better than humans, but I beg to differ.

Q What was the main problem you faced while learning and implementing AI?

A During my time, there were limited resources, since the Internet back then wasn't as good as these days. We studied using books, and the practical aspects were hindered with the available computers being very weak. The RAM was limited, the processing speed was slow, so the programs we wrote for our practicals were simple and mundane. Also, there was a lack of skilled human resources online or offline. So, if we had any problems or questions, we couldn't ask anyone. There weren't this many discussion forums online.

Nowadays, I see that there are a lot of youngsters who are enthusiastic about learning AI and machine learning, but I feel many are being drawn just because of the buzzwords. So, I suggest that they shouldn't run towards buzzwords, but instead, they should try to have a deep understanding of AI, for which a strong foundational knowledge in Mathematics is really necessary. With the strong mathematics plus certain logical reasoning, perception along with the help of proper guidance and supervision, the young people will head towards the right path.

Q Where do you think the future of AI and Machine Learning is headed?

A The next generation is all about AI, most things will be automated, be it in industries or analysis of research. Right now, the number of people in the AI field is insufficient. Even though big advancement is being made in AI and its technology, there still lacks skilled manpower to make use of such technology.

By 2025, I believe that most companies will develop reskilling programs for teaching its employees to implement AI properly which means around 75% of companies in the future will invest in reskilling programs just to bridge the rising gap between AI technology and human resources. I think the future of AI has great prospects. In the present, AI is divided into many categories like Neural Networks, Fuzzy Logic, Natural Language Processing and in the future, the field is going to be divided into even more specific sections. So, the more we dive deep into the domain of AI, the more new theories we have developed and we are fully headed towards automation.

Q Have you heard of Nvidia's DLSS technology? What could be the use of such AI-driven image upscaling technology other than that in video games?

A As I understand, DLSS is an AI-based graphics rendering technology which is using Tensor cores in Nvidia's GPUs. Right now, they are using this technology for better performance in video games by upscaling a low-resolution image to a high-resolution image.

Now, other than that, I can see this technology being used for Computer vision and 3D vision. For example, this technology can be very useful for displaying the images formed in the human imagination. Some other technology would be used to capture the data of images and to present/render the image from this data into a device, this AI-driven upscaling technology could be used.

Human Computer Interaction Principles for Data Visualization

Mala Deep Upadhaya
CS 2016 Batch

A year back, I got an opportunity to read Human-Computer Interaction (HCI) under the course instructor, Assistant Professor Sushil Shrestha. There, I came to know about various human psyche principles presented in the domain. I was so excited to explore multiple such principles from the view of Data Visualization. Data visualization is a high bandwidth connection between data on a computer system and the human brain, facilitated by visual communication. Thus, by understanding how different psyche principles influence human behavior, we can design our products (Viz, Graphic, UI/UX, etc.) to elicit specific responses and actions from our users. We can create a significant impact by being more empathetic and user-centric.

Here, I will share how five different HCI principles can help us create impactful visualization.

- Miller's Law - Chunk It
- Jakob's Law - Users love the well known
- The Von Restorff Effect - Remember the unique
- F-Pattern - Design for scanning, not reading
- Hick's Law - More information; longer time to grab one

MILLER'S LAW

If you want to understand something, you first have to imagine that what you are hearing or reading is true and take it from there.

— George Miller

Miller's law, proposed by George Miller, tells us that we can only keep around seven items in our working memory. Anything beyond that is tough to recall. Having more than seven elements generates confusion and loss of focus of the user, and the user can no longer remember the information he/she is trying to get.

Creating a dashboard with more than seven different objective-wise elements is not good. Instead, if we have ten charts to incorporate in a dashboard, we can chunk them and make two dashboards. In simple terms, Miller's Law implies that we should reduce information overload (cognitive load) and the visualization's complexity.

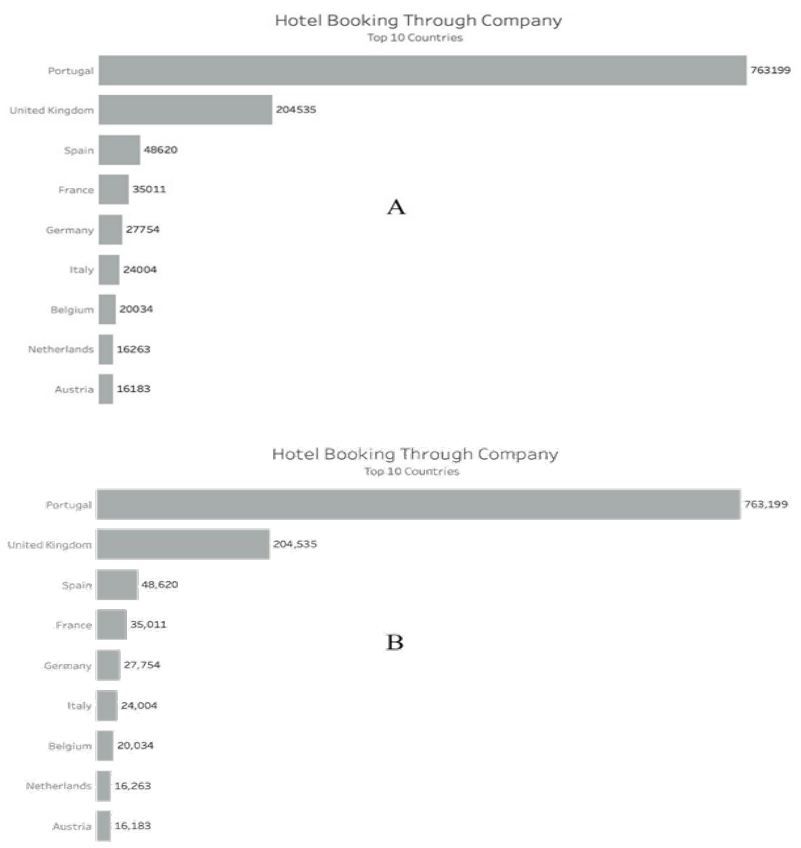


Figure 1: Image by the Author. Data by the Jesse Mostipak at Kaggle.

Which one do you find easy to read and remember, A or B?

I am sure Portugal 763,199 is easy to remember than Portugal 763199, so in B, we used Miller's law. A straightforward approach to implement Miller's law is to chunk, as chunking form seems easier to scan and less daunting to complete.

Figure 2: Designed by the Author.

JAKOB'S LAW

Design for patterns for which users are accustomed.

— Jakob Nielsen

Jakob Nielsen, one of the world's most influential designers, proposed Jakob's law. It states that users favor familiar experiences. They tend to prefer visualization/charts similar to those they have already explored. They already know what such charts represent and will require less effort to understand. So, we can say familiarity is security, and users love the well-known.

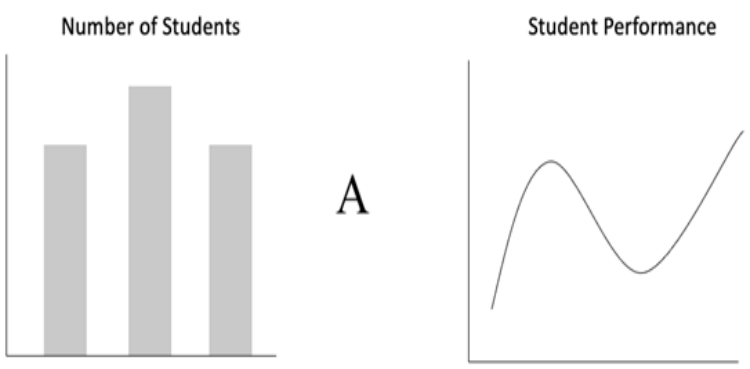


Figure 3: Image by the Author.

Please, remember this graph and what it is trying to say.

Does this mean we should copy a popular visualization? Not exactly. Instead, we should study such great design in the community we are designing for by conducting depth analysis and focusing on how the experts design for similar needs.

Our goal here is to identify famous styles within the industry we are designing. Inclining with a known manner will help us establish the right user expectations and create familiar experiences.

I hope you still remember the graph I requested you. Now, do you find any difference in the charts and its objective?

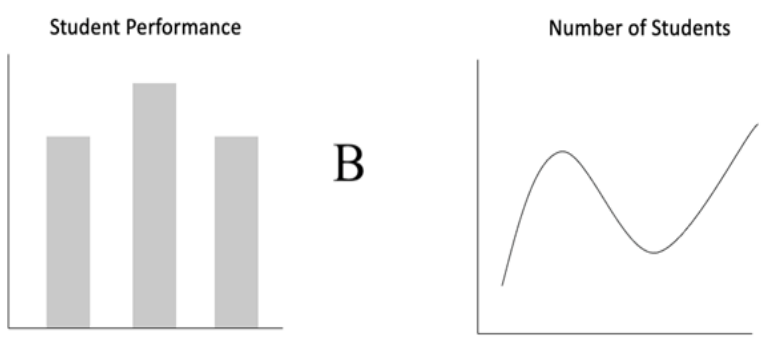


Figure 4: Image by the Author.

I bet you do. Yes, as we already saw the bar graphs for the Number of Students, our mind had already captured it, and whenever we see the title, Number of Students, we immediately incline the bar chart with it. But when I put the bar chart to Student Performance, it creates little time to think for a user to adjust with new information. Using this law, we can pursue users not to think much while enjoying the visualization.

THE VON RESTORFF EFFECT

If you want people to remember something, make it stand out.

— Hedwig von Restorff

Eighty-seven years ago, Hedwig von Restorff, a German psychiatrist, conducted a memory experiment. She gave people a list of similar but distinct items. One item on the list was a unique color from the opposite things. When Hedwig asked her research participants to remember the list, she found that the uniquely colored item's recall rate was drastically higher than the other stuff. Thus, the Von Restorff Effect or isolation effect or specific encoding states that when we see a group of similar objects, we will often remember the one that mostly differs from the others.

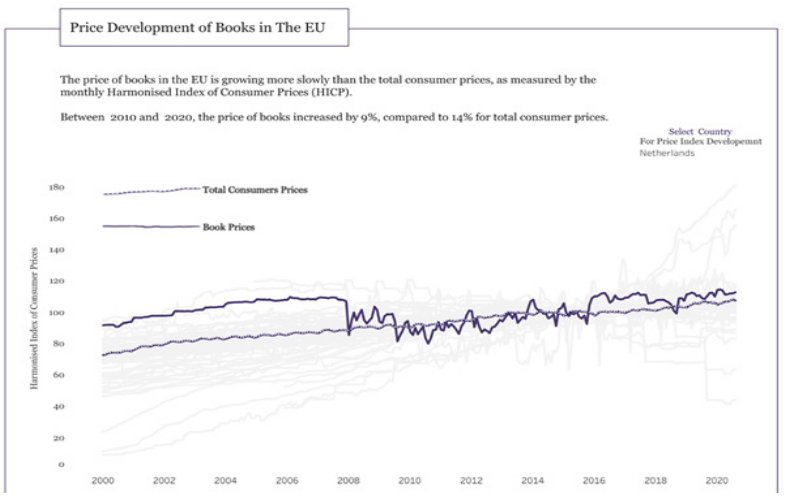


Figure 5: Image by Author. Data by Eurostat.

Here we highlighted the concerned (essential aspects) country, Netherlands, only thus attracting user attention. This principle makes all the difference when we are trying to help users remember. Mostly size, color, and shapes are used to apply this principle.

F-PATTERN

In the attention economy, anyone trying to connect with an audience must treat the user's time as the ultimate resource.

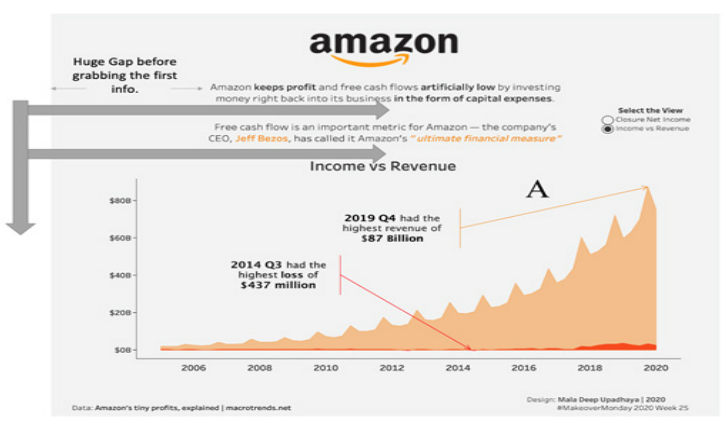
— Jakob Nielsen

Jakob Nielsen (Remembered this name!?), one of the world's most influential designers, discovered F-Pattern, the most cited and the most useful eye tracking resources in the design community. The F-pattern represents where a viewer typically focuses on the sites/visualization, following the letter F ('F' means fast). The report suggests that:

- The two horizontal bars on the F are the top most essential pieces of information.
- The vertical bar represents the reader tending to read the page's left side, and only the first few words.
- People don't read online. They scan.

Figure 6: The NNGroup demonstrates how eye-tracking studies revealed that users (in left-to-right reading cultures) typically scan massive blocks of content in a pattern that looks like the letter F. The areas where users looked the most are colored red; the yellow areas indicate fewer views, followed by the blue.

Our visualization should design for scanning, not reading, so the best content should be anchored across the top with left corner precedence. This spot is guaranteed to get noticed, as using this will make the reading experience engaging. However, we should also think in a way that if someone who is scanning our page finds it attractive, they will read so we can place information in places outside the F too.



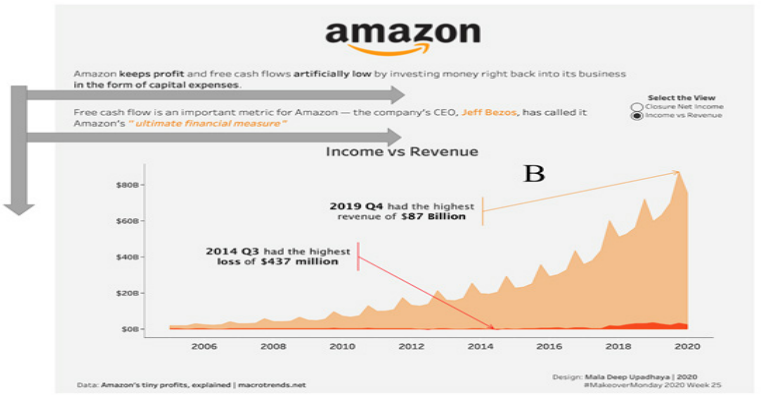


Figure 7: Creating the F-pattern in the Visualization. Image by the Author. Data by the Macrotrends.

Here on A, we see that centering the content creates a little gap in the design; thus, it consumes user time of exploration. However, on B, we align the text on the left so the user immediately starts absorbing the content (Some of us might disagree with this, but I used this for understanding purposes only). Thus, there is a pattern of F.

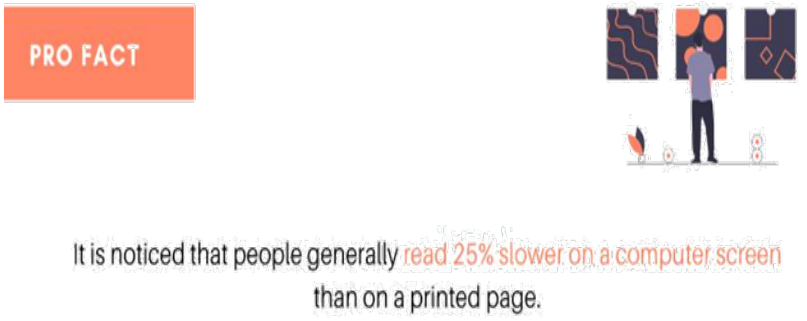


Figure 8: Designed by the Author.

Making sure to stick with the F-pattern will ensure our visualization make a meaningful impression on our audience. If you want to explore more about such patterns, here are some worth checking: Gutenberg Diagram, Layer-cake pattern, Spotted pattern, Commitment pattern, etc.

HICK'S LAW

Reduce the number of stimuli and get a faster decision-making process.

— William Edmund Hick

Hick's law or the Hick-Hyman's law or rate of gain of information, proposed by British and an American psychologist team of William Edmund Hick and Ray Hyman, tells that time it takes for a person to make a decision depends on the possible choices he or she has. That is, increasing the number of options will increase the decision time logarithmically.

In layman's terms: The more there is to pick from, the longer user takes to select. Do you feel this resembles with K.I.S.S (Keep It Short and Simple) design approach?

Yes, K.I.S.S. echoes Hick's Law. The K.I.S.S. (Keep It Simple Silly or Keep It Short and Simple) originated from Hick's law, causing simplicity in its design and development. The objective of Hick's law is to simplify the decision-making process, not eliminate that process. Moreover, we can say it is all about how we arrange our information architecture.

So, in visualization, providing vast information will give rise to more choices (info), and the user will take a longer time to pick one. (Remember, we do not use Hick's law in a segregated manner. We always combine it with other HCI principles.)

Information overload in our visualization directly affects the principle of Hick's law as we "might" start by trying to decide what to grab next. Still, soon, we are going to err.

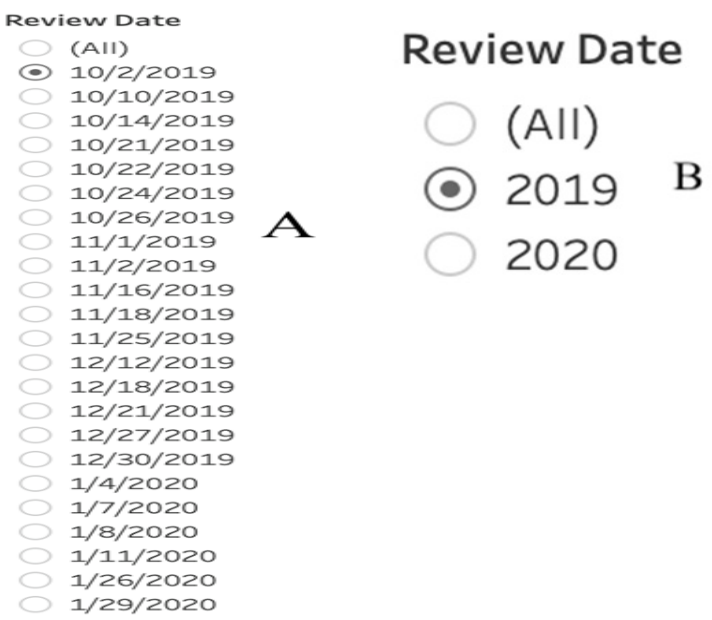


Figure 9: Image by the Author.

Here on A, we have many options to pick from, and our users will take a couple of moments to decide which to choose. On B, we have three options, so there is not so much need for decision time. Thus, in B, we used Hick's law. Shortening the long lists and reducing the number of options possible is a straightforward approach for implementing Hick's law. In cases where long lists are inevitable, we should limit the number of options the user can view at a single time to make scanning more comfortable and faster.

Thus, if you made this far, we can see that the proper use of the above principles in an efficient manner will bring our visualization to the next level. Using these principles, we will present data in the best possible way to satisfy our audience's needs. Next time, when you jump into making the design, think about where and how you can apply these principles.

Closing with Milton Glaser quote:

"There are three responses to a piece of design — yes, no, and WOW! Wow! is the one to aim for."

Biometric Authentication with fingerprints

Shreya Shrestha
CS 2018 Batch

Biometric authentication is an advanced layer of security mechanism. Every person in the world is different. They have distinct identifiers that make them different from one another. These identifiers are in use to secure devices and information. Biometrics are biological measurements or physical characteristics that identify each individual. Modern cybersecurity considers a biometric security system to be a powerful solution to security problems that are not solved using a traditional password system. We have been using biometric authentication in our daily lives, such as fingerprint authentication, face scans, retinal scans, and many more.

Figure: Illustration of the concept

The fingerprint is an impression or mark made by the friction ridges of human fingers. There is a theory that a fingerprint on our fingers and thumb makes it easier to hold things by creating friction between our hand and the object we are gripping. Fingerprints vary from person to person. These fingerprints develop through a random process of code in DNA. Therefore, no two people in the world have the same fingerprints, not even identical twins. Moreover, this fingerprint remains the same throughout life. This unique fingerprint helps in the identification of the person. Hence, fingerprints are used in forensic evidence as well as in authentication.

Capturing the fingerprint is the first stage in storing, processing, and using biometric data for authentication. In the biometric process of fingerprint scanning, minutiae are the specific features in the fingers. There are mainly two types of minutiae: ridge endings and bifurcation (the point at which two rides meet). The number, as well as the location of the minutiae, differs in every finger. After capturing the fingerprint, the computer measures the distances and angles between the features by drawing lines between them. This information is converted to a unique numeric code using an algorithm and stored in the database.

There are various ways of storing biometric data, such as hardware-based recognition systems, portable token systems, and many more. In a hardware-based recognition system, the biometric data is stored in specific hardware and works with devices to recognize the data without storing the data in that device. In the portable token system, a token, such as a fob or smart card, is used to store biometric data. After capturing biometric data, a template of the biometric data is made and stored on the token. Another way is to store biometric data in the user's end device. Various smartphones we see today, with fingerprint sensors, use this method.

Figure: Illustration of the concept

There are two stages of operation in biometric authentication. The first stage is known as enrollment. During the enrollment operation, the fingerprint is scanned, analyzed, and stored in the database securely. Usually, it takes less than a half-second for the enrollment process to complete. After enrollment, the next stage is verification, where the system performs a one-to-one comparison. Here, the recently captured fingerprint is compared with the previously stored fingerprint in the database. If the fingerprint matches, it is verified that the person is the one who he/she claims to be. After successful verification, the person can access the system.

Biometric authentication using fingerprints has not only provided an advanced layer of security but also has made life a lot easier. Entering a password to access the system seems very tedious and time-consuming. But with biometric authentication, the process has fastened up. To protect your phone, registering a fingerprint takes less than a minute. And to access your device, you only have to place your finger on the scanner. Although, sometimes, people can fake fingerprints, using fingerprint authentication still could be the best option.

Prediction of share market using machine learning

Anish Manandhar
CE 2019 Batch

Nepal recently witnessed the biggest IPO ever in its history in which **Nepal Infrastructure Bank Limited** had issued 8,00,00,000 units as Initial Public Offering out of which 7,58,40,000 units were offered to the general public. Many youths were attracted to the share market after knowing about this. Primary markets are less risky than secondary markets, but it takes fundamental and technical knowledge to predict what might happen with the stock when it comes to the secondary market that we have bought in the future. The price movement is highly influenced by the demand and supply ratio. I always wonder how our life would be if our predictions came true in the stock market and fortunately found few techniques which I would love to share here.

Linear regression

- Linear regression will help us in predicting the continuous values approach of modeling the relationship between a scalar response and one or more explanatory variables (also known as dependent and independent variables).
- It is one of the technical and quantitative analysis. The key is to find a way to identify price modality considering the market trends.
- It is a wonderful approach to predict the stock market.
- It is the analysis of two separate variables to define a single relationship (generally time and closing price). After plotting stock prices along with a normal distribution, we get a regression line that allows us to predict whether the stock is pricing up or down.

Time series

- Time series models are the models that can be used for time-related data for the analysis and prediction of stock market time-series data, which involves considerable interest from the researchers over the last decade.
- It is an essential tool for data prediction in future demands.
- Deep learning methods offer a lot of promise for time series forecastings, such as the automatic learning of temporal dependence and the automatic handling of temporal structures like trends and seasonality. Standard Python libraries like Keras, TensorFlow can help in developing deep learning models for time series models.

ARIMA

- ARIMA is one of the model which is used for predicting futuristic time-related predictions such as share market.
- Box - Jenkins Analysis is one of the systematic methods of identifying, fitting, checking, and using integrated autoregressive, moving average (ARIMA) time series models. This method is appropriate for the time series of the share market. It deals with the series that exhibit a simple trend, which is not stagnant and varies with time.

LSTM

LSTM is another technique that has been used for stock price predictions. LSTM refers to Long Short Term Memory and makes use of neural networks for predicting continuous values. LSTMs are very powerful and are known for retaining long term memory.

Reinforcement learning

- Reinforcement learning is an area of Machine Learning which can be used to the stock price prediction for a specific stock as it uses the same fundamentals while using fewer data.
- It is one of the most successful in predicting the stock market and working in an agent-based system (where the agent takes actions in an environment where the goal is to maximize the record) to give higher returns.
- Reinforcement learning differs from supervised learning as reinforcement learning is all about making decisions subsequently.
- In simple words, we can say that the output depends on the state of the current input and the next input depends on the output of the previous input, whereas in Supervised Learning, the decision is made on the initial input or the input given at the start.

To sum up, predicting the stock market has always been a hot topic, be it on our tea-talks or business news. It is indeed one of the most laborious tasks. Many have committed suicide because they lost everything on this market. Decades have passed acclimatizing this market, but nobody has been free from mistakes just to predict correctly. How could a machine be? Machine learning, albeit has the capability to predict the stock market to some edges, but stocks are ever-changing as well as dependent on various social factors like on 28 April 1992, the BSE experienced a fall of 12.77% - due to the Harshad Mehta scam. The whole world's stock market had a serious nose-dive due to the global pandemic, and NEPSE was no exception.

The Birth of Silicon Valley

Sagar Uprety
CS 2018 Batch

You all might have heard the term 'Silicon Valley' and probably know it as a global innovation center for tech giants like Google, Facebook, Intel, and Apple. But, do you know why it is termed Silicon Valley and how did it all start? Well, let us travel back in time and find out all the secrets. It all started in the late 1940s with the Nobel Prize-winning discovery of 'transistor' by three physicists in AT&T's laboratory. This semiconductor device would soon create a tech revolution that would change the lifestyle of people around the globe. In 1956, MIT scientist William Shockley left his laboratory to start a new business in Mountain View; yes, you guessed it right, the same place that currently houses Google and NASA's HQs. However, back then, it was just a small farming area 50 miles south of the San Francisco Bay Area. Initially, Shockley faced many challenges as the region was far behind other cities like New York and Boston in the chip industry. Many experts speculated that it was almost impossible to create a tech ecosystem in the area due to its remoteness, limited funding resources, and strict immigration policies. But, this would change soon as he secured financing from outside the Bay Area. Finding talents, however, was a greater challenge as no schools in that area, including Stanford, had a program that taught about semiconductors. Shockley then traveled across the US to meet graduates and engineers and succeeded in forming an eight-member team of high potential to start the company. However, due to his misbehaving character and unfriendly nature, the company fell, and all the eight members resigned on the same day.

The second chapter of this historic adventure begins with Arthur Rock, a young New York Banker who received a letter from Eugene Kleiner, one of the eight employees who left Shockley's company. These eight people (shown in fig. 1) had dreamt big before being let down by Shockley and were in hopes that Arthur could offer them employment. However, Arthur had a different surprise waiting for them. He suggested and convinced the team to start their own company and promised them to take care of the funding. After being rejected by more than 35 potential investors, Arthur met Sherman Fairchild from FC&I (Fairchild Camera and Instrument) and finally succeeded in securing the funds. The group named their company 'Fairchild Semiconductors' and opened the business in Palo Alto in 1957.

Figure 1: Co-founders of Fairchild Semiconductors

Soon their fortune would change as the company took off and landed contracts with IBM and US Military Intercontinental Missile Program in 1959.

Now, it was the time for a big show and possibly the most important phase of the Silicon Valley revolution. Soon after Fairchild's success, the eight co-founders inspired their employees to expand the business and start new companies. In 1959, the general manager left to start Rheem Semiconductors, and two other groups followed him soon to found Signetics and Molectro. The expansion of Fairchild's company had already begun but, what boosted these new small companies was the reinvestment and support that the eight co-founders gave to them. Four of them gave rock funding to start the Bay Area's first venture capital that invested in another 15 companies. Two founders, Moore and Noyce, started Intel (shown in fig. 2) in 1968. And another founder helped with financing a former employee who, later on, founded AMD. By the mid-1960s, the group was already generating $90 million in sales, and Fairchild Semiconductor became the second largest competitor in the chip industry and employed over 4000 people. In less than 14 years, Fairchilds produced over 30 of such spin-off companies, and almost all local chip companies and firms could be linked back directly to the initial eight co-founders. By 1970, the San Francisco Bay area was no longer a farming community but a tech hub and employed over 12000 people.

Figure 2: Intel in its early days.

In 1971, Don Hoefler, an American tech journalist, wrote an article about computer chip companies on Electronic News introducing the term 'Silicon Valley' and well folks, it's how this place got its name. The cycle of ambition, growth, commitment, and reinvestment by large companies such as Fairchild's is what helped small businesses and startups to grow exponentially and form the Silicon Valley that we know today. Following the principle in 1972, Sequoia Capital, funded by Valentine, invested in the team behind Google, Cisco, and several other companies. The 1970s was also the same time when Steve Jobs was then starting his career. As a learner himself, Steve realized the opportunity and took advice from Noyce, co-founder of Intel and Fairchild, to learn about the entrepreneur mindset. Later on, Don Valentine, a former Fairchild executive, and Mike Markkula, a former Fairchild employee, provided Apple with the first two investments. Apple was officially launched in April 1976, and Mike went on to become Apple's second CEO in 1977. Jobs followed his lesson from Noyce and mentored younger entrepreneurs, including (guess who?) Mark Zuckerburg, who later co-founded Facebook in 2004.

Figure 3: Google Headquarters.

Out of 130 tech companies that were trading on the New York Stock Exchange in the late 1970s, 92 companies had backlink to the Fairchild's, and these businesses had a total net worth of over $2.1 trillion and employed over 800,000 people. Wow! That's some mind-blowing stats, isn't it? Well, we have covered a lot, but this was just the birth of Silicon Valley. The story does not end here.

After the 1980s, several talents, investors, and companies joined this tech revolution and went on to founding companies like Tesla Motors, Youtube, WhatsApp, Linkedin, Netapp, and others. The government separated the funds. Even schools like Stanford started introducing programs such as Computer Science to produce in-house young talents. Although a lot has changed from the 1980s to today (fig. 3 Google HQ as of today), the basic principle of ambition, growth, commitment, and reinvestment remains at the root of Silicon Valley. The other half of the story, after 1980, is just as interesting as this one but, that's for another article in the future.

Key takeaways from the webinar "Entreprenerds' Tales v3.0; Entrepreneurship and youth-the untold story"

Nilima Dahal
CS 2016 Batch

August 7, 2020-The night before the main event, I was sleepless and agog as I was keen to hear some of the highly intellectual Nepali entrepreneurs. The next day was the most awaited webinar, "**Entreprenerds' Tales v3.0**" with the tagline "**Entrepreneurship and Youth - The untold story**". The event was organized by fourth year Computer Science students with the support of Kathmandu University Computer Club (KUCC), Department of Computer Science and Engineering (DoCSE), and Department of Management Informatics and Communication. The speakers of the event were: Rupesh Krishna Shrestha, Shabda Gyanwali, Subash Sharma, Sujeet Regmi, and Surakchya Adhikari.

The first speaker was **Rupesh Krishna Shrestha**, an Assistant Professor of Entrepreneurship and Marketing, Kathmandu University. He is passionate about delivering progressive education and has been bringing innovation and encouragement in the teaching and learning environments among youths. He narrated, "The major reason behind aspiring entrepreneurs dropping their creative ideas are institutional void, structure gap and resource strategies with the fact that getting a job is easier than sustaining as an entrepreneur in the context of an economically unwell country like ours." He requested parents to encourage and motivate their children to achieve higher goals as an aspiring entrepreneur as well as stop them from dropping their ideas/ enterprise. Mr. Shrestha, as a mentor, recommended all the new entrepreneurs to fill the knowledge gap, invest their time wisely, and access a quality human resource (forming an interdisciplinary team) to validate their ideas. He also suggested creating a network of people and finding people with resources to navigate the voids and achieve goals.

The next speaker was **Sujeet Regmi**, Co-founder of Sajilo Marmat Sewa (SMS). He is an inspiring engineer who aspires to create a huge impact on social and economic conditions. He has created jobs for almost 150 people. Talking about his experience with us, he highlighted that implementing the ideas to build a startup seemed difficult for him in the beginning. He left his job to pursue a dream of becoming an entrepreneur but faced many hurdles as Rupesh Krishna Sir had mentioned earlier in the event. He stated, "Writing a business plan is much easier than implementing." He added, "Investment is one of the major issues beginners face and way out to the challenges faced every day is a pathway to success." He concluded that his glutton for his startup is the reason he is successful today.

After that, we had **Surakchya Adhikari**, Co-founder & Chief Operating Officer at Thulo.com, as the next speaker of the event. She is an intellectual lady capable of operating and providing technology and infrastructure for operating businesses online. She talked about her experiences and hurdles in digital marketing platforms in our country. She stated, "Sustaining a business is one of the greatest hurdles in maintaining balance and strategizing." She gave her insights on how e-commerce websites have appraised the market and created many opportunities within a few years. She is indeed a risk-taker and hence a successful entrepreneur.

Subash Sharma, CEO of F1Soft International Pvt. Ltd., is a decent and hardworking person who focuses on creating a positive impact in the daily lives of Nepalese people through simple, secure, affordable as well as innovative solutions in technology. By his experience sharing, we got to know that eSewa, the product launched in 2009, faced many hurdles while becoming the success it is today. He concluded that passion and patience among the team led F1Soft International Pvt. Ltd. to become one of the fastest rising innovations today. His story encouraged all the participants to aim higher, move forward with the business, and create an impact on others' life. He came to an end by saying, "Validating and brainstorming the business idea is one of the major things to keep in mind. And never hesitate to drop an idea."

As the last speaker of the event, we had Shabda Gyanwali, Investment director, Dolma Impact Fund, a pioneer with leadership and moderation who has always influenced many people. While talking about his journey at the webinar, he stated, "The major points which an investor seeks before investing in any business are proofs of concept, team, system validation and the existence of a business (long-term/short-term). These things play a vital role for the investor in deciding whether or not to invest". Likewise, he also talked about how the various components such as market opportunity, business model, execution, cash scheme, mentorships, etc. have a huge effect on any business startup today. He encouraged aspiring entrepreneur youths to talk to a mentor and figure out the challenges that might come their way. He concluded by explaining that taking help from books and numerous research is a great way to solve the challenges and also the key intake to a flourishing business.

The Beauty of Data Visualization

Sumit Sah
CS 2018 Batch

As the saying goes, "A picture is worth a thousand words," when a story is told graphically, with a well-built design, instead of verbally, it undeniably makes more impact. John Tukey, an influential American mathematician as well as theoretical statistician, once said, "The greatest value of a picture is when it forces us to notice what we never expected to see." Pictures and visualizations of any kind have a more powerful impact on their audience than written words. That is because visuals are firmly tied to memory. In this article, I will be explaining what data visualization is and why it matters.

What is Data Visualization?

In simple words, Data visualization is a visual presentation of data or information. It enables decision-makers to see analytics presented visually and they can grasp difficult concepts or identify new patterns. Typically, data is visualized in the form of a chart, infographic, diagram, or map. The goal of data visualization is to communicate data or information clearly and effectively to readers.

History of Data Visualization

Data visualization has a long history. It made significant advances between the 17th and 19th centuries. The idea of presenting quantitative data graphically came about in the 18th century when Rene Descartes invented a two-dimensional coordinate system to display mathematical operational values. That system was improved when William Playfair pioneered graphical forms as we know them today. He is credited with inventing line and bar charts, and later the pie chart and circle graph. Today, data visualization has become a rapidly evolving blend of science and art that is certain to change the corporate landscape over the next few years.

Why is data visualization important?

With so much of information being collected through data analysis in the business world today, we must have a way to paint a picture of that data to interpret it. Data visualization gives us a clear idea of what the information means by giving it visual context through maps or graphs. That makes the data more natural for the human mind to comprehend and hence, makes it easier to identify trends, patterns, and outliers within large data sets.

No matter what business or career you have chosen, data visualization can help deliver data in the most efficient way possible. As one of the essential steps in the business intelligence process, data visualization takes the raw data, models it, and delivers the data to aid in reaching a conclusion. In advanced analytics, data scientists are creating machine-learning algorithms to better compile essential data into visualizations that are easier to understand and interpret. The large volume and complexity of data can be difficult for our brains to comprehend and process. That is where visual elements such as tables, charts, and graphs provide powerful representations of large amounts of data points that the human brain can process.

Turning the data into a story:

So, what does it mean to "Tell a story with data"?

Data is just a collection of numbers until you turn it into a story. Showing reports and dashboards can be overwhelming without adding a narrative to the data. Any great insight explains what happened, why it is valuable, and how you can use it to turn it into something actionable. Data visualization is about using data and statistics in creative ways, to show patterns and draw conclusions about a hypothesis, or prove theories that can help drive decisions in the organization. Data visualization can be any map, chart, graph, etc that you can make into a simple JPEG image, a video, or even a 3D model like the one above. The only criterion is that the visualization must communicate data.

With the rapid spread of the novel corona-virus across countries, the World Health Organization (WHO) and several countries have published the latest results on the impact of COVID-19 over the past few months. Here, Data visualization plays a chief role in telling the story with the help of the datasets.

Visualization techniques have been front-and-center in the efforts to communicate the science around COVID-19 to a wide range of audience of policymakers, scientists, healthcare providers, and the general public. Social media feeds are inundated with infection heat maps and charts depicting transmission patterns. The aim here is to understand how visualization helps to derive informative insights from data sources.

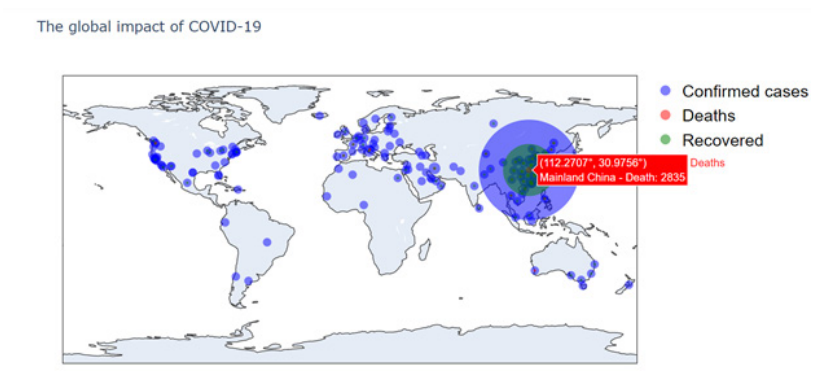


Figure: Global Impact of COVID-19

From the above chart, we can observe that the disease has infected plenty of people all around. Even though the infected region is large [in blue], we can notice that the number of deaths is considerably low, and there have been many recovered patients to this date. Therefore, with the help of this data visualization, we can easily spot the status of Covid-19 across the world. Creating effective data visualizations will help disseminate accurate information with the right message.

In the world of digitalization, visual information helps us to see the patterns and connections that matters. Then, we can design that information such that it makes more sense, or tells a story, or allows us to focus only on the essential information.

Blended Learning in Higher Education

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"Technology will not replace great teachers, but technology in the hands of great teachers can be transformational."
-George Couros.

One of the many challenges for higher education concerns the implementation and deliberate application of blended learning. Blended learning has been valued and implemented for various reasons in higher education, such as addressing a need for more flexible and personalized curricula, responding to student's diversity by using differentiated instruction, or improving student's engagement with learning materials. Over the past two decades, higher education institutions have increasingly adopted blended learning for various reasons. Also, the pedagogical concept configures itself as the "new normal" in higher education. The application of blended learning affects students, several institutional systems and structures, and faculty member's attitudes and pedagogical beliefs. Although the definition of blended learning is still ambiguous, the pedagogical concept of blended learning can be described as the deliberate combination of online and classroom-based instruction that activates and supports learning.

Educational institutions have adopted blended learning for various reasons, either for providing more flexibility to meet students' learning needs and backgrounds or as an attempt to reduce dropout rates. The value in blended learning comes from the ability to create student-centered lessons that allow students to practice the skills they need to develop at their own pace.

Blended learning opportunities and challenges:

1. Allow teachers to experience blended learning as a learner.
- Encountering blended learning as learners can inform the teacher's thinking about planning rigorous, project-based learning opportunities and the supports that are necessary for student success.
- Differentiating professional development based on teacher needs and focus areas can demonstrate how a blended learning setting can enhance learning and engagement.

2. Encourage peer observations in blended learning classrooms.
- Effective professional development should include peer observations and collaboration, modeling of innovative best practices, and the integration of blended learning programs in instructional practice.

3. Offer technology implementation training, including a lesson on educational software utilization, troubleshooting, and student data analysis.
- Technological fluency is critical for success. Any training on technology should be grounded in instructional practice with clear connections to how technology can enhance and inform students' learning opportunities.

4. Teach classroom management strategies, especially for a blended learning classroom.
- Establishing traditional classroom expectations, educators must consider the impact of digital citizenship as well as logistical considerations regarding software access and hardware management.

5. Analyze institutional and pedagogical contexts.
- Analyze the preparedness of the institution in terms of technical/financial infrastructure, administration, personnel, and ethical/ political philosophy.
- Analyze learner's characteristics and needs to know their demographic information, academic levels, geographic distribution, prior knowledge, and anxiety level.
- Content analysis and Goal analysis.

6. Select appropriate instructional modes and forms.

7. Select relevant technology and resources.

AWAN SHRESTHA
CE Batch 2017

How the Web Works | Behind the scenes of a Website

You type some words on your keyboard and hit ENTER, or you just click on a link on the internet. Either way, you land up on some website. So, how does it happen? Be it you are just a curious techy explorer or an aspiring web developer, understanding the fundamentals of the web will help in the long run.
In this article, we will discuss the behind the scenes of a website. What happens when we view a webpage on our computers or phones?

The Journey in a Nutshell

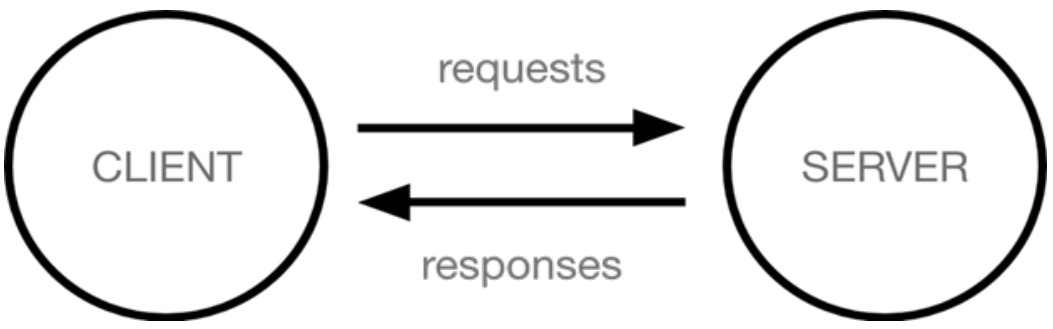
The moment we hit ENTER after typing the URL or click a link to the website, the request is sent to Domain Name Server, which is like the phone book for websites. The Domain Name Server converts the human-readable website URL to IP address for the server, which hosts the website. An IP address is like a unique identifier assigned to every single device connected to the internet.

The browser then makes a request to the server, which hosts the website with that IP address. The server handles the request and sends the response to the browser. Then it starts sending the website files in small chunks. The browser assembles the chunks and displays the full website to us in the form of a web page.

Now, let us dive deep.

Clients and Servers

The web is a client-server system. Your computer is the client, whereas the remote computers that store webpages, sites, or apps are the servers.



When you want to view a website, the client device (your computer) makes a request to the server (some computer on the internet where the website files are hosted), downloads a copy of the webpage from the server, and displays it in the web browser.

In this client-server model, the internet connection allows the devices to send and receive the data on the web.Then, there is TCP/IP (Transmission Control Protocol and Internet Protocol), which is a networking protocol that allows two computers to communicate.

So, when we type the URL of the website, something like techyexplorer.com, and hit ENTER, the request goes to one of the many special computers on the internet known as Domain Name Servers. But why?

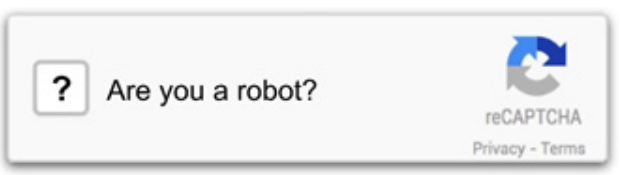
DNS Explained

Internet is massive. How do the computers know where each other are?

So, if you visit techyexplorer.com, how does your browser know where the techyexplorer.com server is on the internet?

That is where the Domain Name System (DNS) comes in. DNS is like the phonebook of the internet. The real web addresses, the IP addresses are just strings of numbers like 63.245.215.20.

It represents a unique location on the web, but it is hard to remember. We are humans. We might be able to remember the names of hundreds of websites, but to remember something like IP addresses; it is tough. Of course, unless you are a robot.



The Domain Name Servers translates human-readable domain names that we type in the browsers into IP addresses.

Now, the browser sends an HTTP request message to the server and asks it to send a copy of the website to the client.

HTTP – How computers talk

Hypertext Transfer Protocol (HTTP) is an application-layer protocol that computers use to transmit data. HTTP(S) is the agreed-upon protocol that your browser uses to communicate with the server. It defines how the request and the response will look like, what data they will have, and how it will be submitted.

Additionally, there is HTTPS, which is HTTP Secure. It is like HTTP but encrypted, ensuring that the transmitted data is only viewable by the intended receipt.

Once the server receives the request, it performs certain actions and responds with a status code to the client, which is the server saying, “Yo! You can have a look at the website. Here it is.”

Then, the server starts sending the website files in chunks of packets to the client device.

The browser assembles the small chunks into a complete web page and displays it to the user. But what are those website files?

Website Component Files

So, now we know that visiting a website is requesting website files from a server computer on the internet and our browser creating a webpage for us from those files. Those website files are mainly of two types:

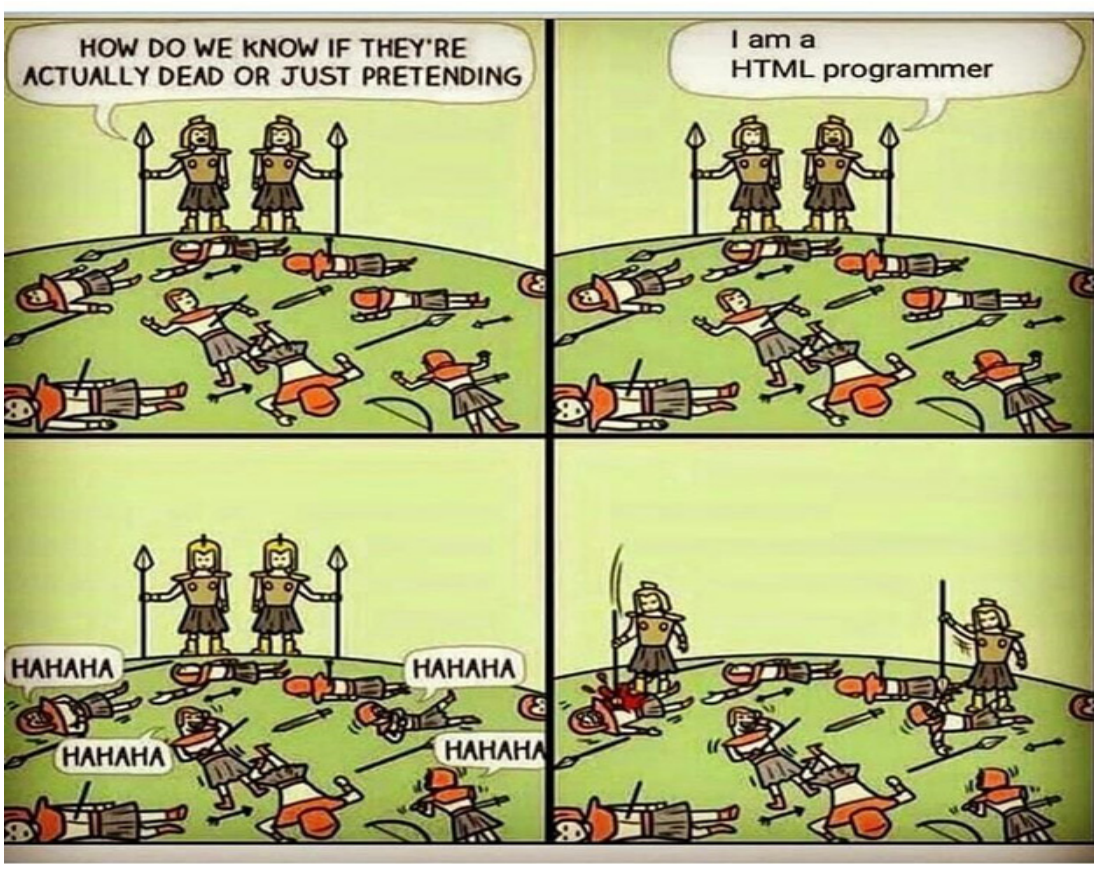
1. Code Files

The websites are primarily built using HTML, CSS, and JavaScript. Let’s have a look into them:

a. HTML – The Skeleton

HTML is the core markup language for creating web pages. It stands for “HyperText Markup Language.” It describes the structure of a webpage.

Technically, it’s not a programming language – we can’t write any logic with it.



b. CSS – The Styling

Cascading Style Sheets (CSS) is the language used to style HTML documents. It is a style sheet language that describes how the HTML elements are to be displayed on the screen.

c. JavaScript- The Dynamic and Interactive

HTML and CSS are mainly for the look and are static. JavaScript gives the web page dynamic and interactive capabilities. It can be used to change the website whilst the user is viewing it.

2. Asset Files

The server would not only send the code files but also send other files like images, videos, audios, etc. and we collectively call these files the asset files.

Therefore, the browser assembles all these files and presents a beautiful web page to you.

One more time – How the web works

So, let us do this one more time.

The moment we hit ENTER after typing the URL or click a link to the website, the request is sent to Domain Name Server, which is like the phone book for websites. The Domain Name Server converts the human-readable website URL to IP address for the server, which hosts the website.

The browser then makes a request to the server, which hosts the website with that IP address. The server handles the request and sends the response to the browser. Then it starts sending the website files in small chunks. The browser assembles the chunks and displays the full website to us in the form of a web page.

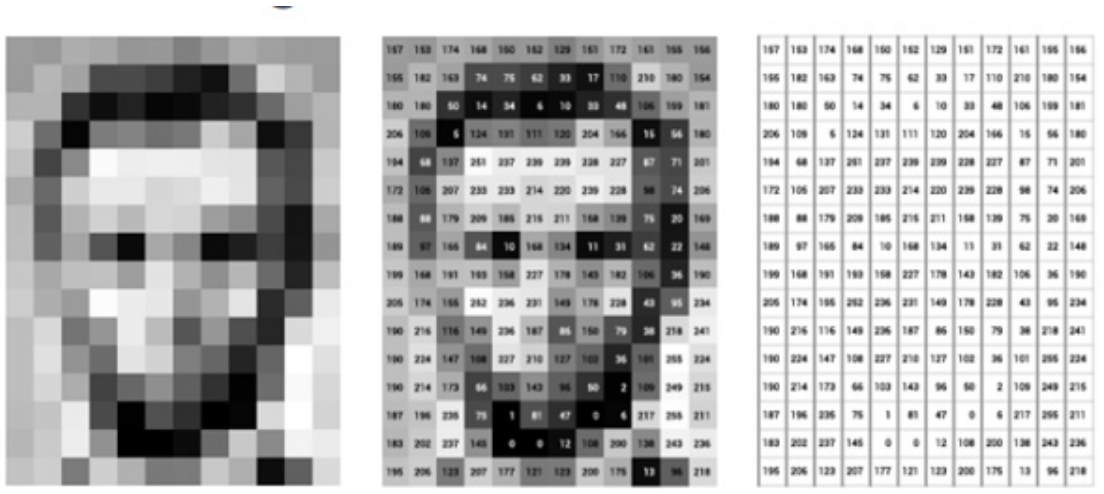
I hope this makes more sense now, and you have gotten an idea about what goes behind the scenes and how the web works.

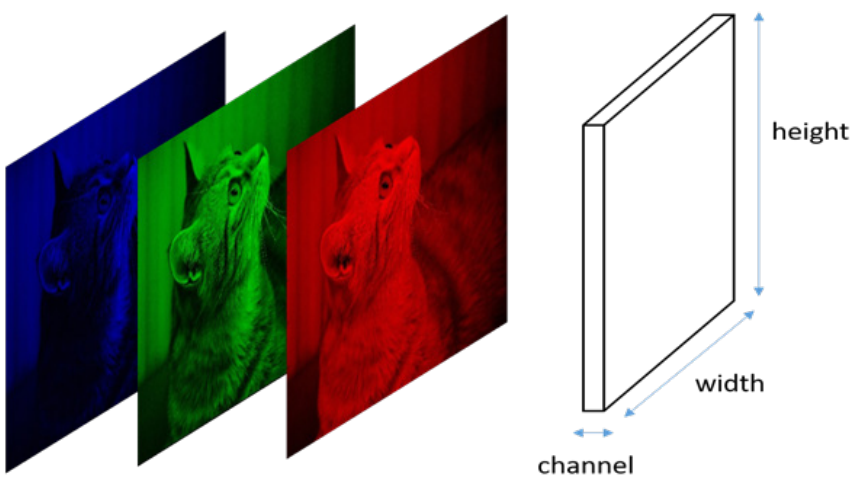
SAMIP TIMALSENA
CE Batch 2018

How Computers Understand Images?

The buzz of "Deep Learning" is significant in the dev-community. It has shown tremendous progress in the field of Computer Vision (CV) and Natural Language Processing (NLP). A lot has been achieved in recent past years. With the advent of pre-trained models and cheaper computation, it's now as easy as pie to train near state-of-the-art (SOTA) models at home for our most vision and NLP problems. When it comes to images, there are various types of image problems. You can have the standard classification of images in two or more categories for a challenging problem like self-driving cars. The fundamental concept in both of these problems is the same, i.e. to understand the images.

The image that we see is a matrix of numbers (pixels). Unlike us, computers can't see images, it can only read the numbers, and that's what an image is. A grayscale image is a 2-dimensional matrix in which the number ranges from 0 to 255. Zero is black, 255 is white, and in-between are the sheds of grey. On another side, a color image, usually an RGB, consists of three 2-dimensional matrices having pixel values the same as the grayscale. The three matrices represent the 3-channels of the RGB image.



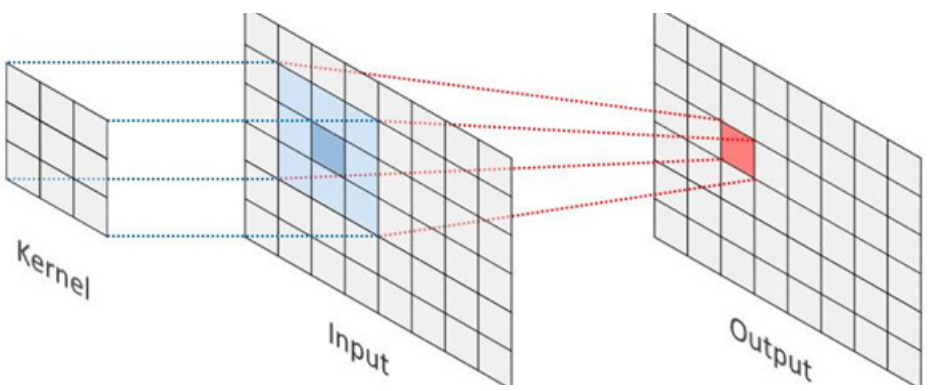


The traditional approach of solving the image classification problems was to consider every pixel of an image as a feature for the model. So, if a grayscale image was of size 28*28, then the total number of features is 784 (28*28). A machine learning (ML) model is then trained on the features with their targets. If a linear model is to be used, the features can be further processed to either normalize or standardize the pixel values. This method was working fine, but SOTA was yet to be achieved.

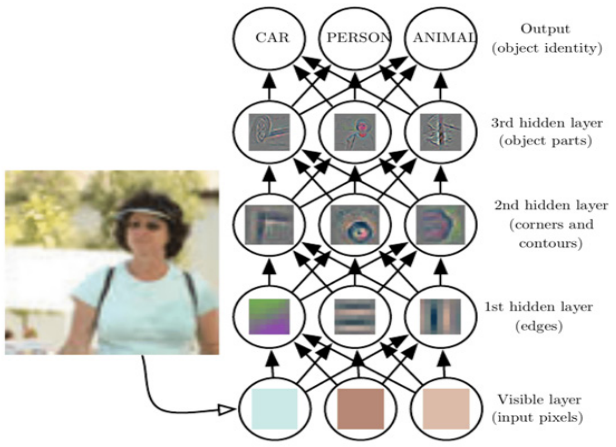
In the 1980s, Yann LeCun, a postdoctoral computer science researcher, introduced Convolutional Neural Network (CNN), a specialized artificial neural network that mimics the human vision system. LeCun had built on the work done by Kunihiko Fukushima, a Japanese scientist who, a few years earlier, had invented the neocognitron, a basic image recognition neural network. The early version of CNN, called LeNet, could recognize the handwritten digits.

This neural architecture has enabled us to achieve the SOTA results for the vision task. The SOTA CNN models include VGG, ResNet, Inception, and many more. These models have been trained on the Imagenet dataset (image dataset with over 14 million images). Using the pre-trained weights of these models, we now can solve classification problems in a few lines of code.

The important part of the CNN architecture is the convolutional layer. In this layer, a kernel/filter of size m*n slides across the pixel values. The value of the kernel and the pixels is multiplied (element-wise) and summed. As shown in the figure, the kernel's value is multiplied with the value in the blue region to obtain the value of the red region. The values so obtained are passed through an activation function (usually reLU). This is all that happens in the convolutional layer. The image thus achieved is downsampled by passing through a Pooling layer, which is similar to the convolutional one. Unlike convolutional, in the Pooling layer, the max pixel value inside the blue region is selected.



A CNN is usually composed of several convolutional layers and other components.
The kernel of the convolutional layers is initialized in such a way that, some layer detects the edges, some detects corners, and some detect the object part. The final layer of CNN is a classification layer, which takes the output of the last convolutional layer. One thing to note, the more the number of convolutional layers, the more complex features the model extracts from the images.



Though CNN is an extremely powerful and robust architecture, it does have some shortcomings. CNN lacks to capture the context of the images. In one case, a CNN model trained to block inappropriate images on Facebook banned a 30000 years old statue image for nudity. Similarly, CNNs trained on ImageNet, and other popular datasets fail to detect objects when they see them under different lighting conditions and from new angles.

Despite the limits of CNNs, there is no denying that they have caused a revolution in artificial intelligence. Today, CNNs are used in many computer vision applications such as facial recognition, image search, and editing, augmented reality, and more. In some areas, such as medical image processing, well-trained ConvNets might even outperform human experts at detecting relevant patterns.

With immense research going in the field of CV, new model architecture is proposed that could overcome the shortcomings of CNN. The Transformer is an attention-based model architecture that has produced SOTA results in NLP and machine translation. The AI research community is beginning to bring Transformers to the field of computer vision. Facebook recently opened-source Data-efficient image Transformers (DeiT), a computer vision model that leverages transformers. DeiT requires far fewer data and far less computing resources to produce a high-performance image classification model. The coming years will definitely bring more powerful models that can better capture the context and understand the image well.

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Sr. Software Engineer at WesionaryTeam Japan/Kathmandu

Is Next.js 10 Really Awesome?

Next.js is one of the most famous React frameworks for production. Next.js is gaining popularity among the developers since it provides the best developer experience with all the features that we need for production, like Typescript support, hybrid & server rendering, smart bundling, route pre-fetching with "No Configuration Needed."

Recently, version 10.0.0 has been released for Next.js with many exciting features that are making it more attractive for developers and among businesses.

I am going to point out some of the basic features and their implementations in this article. You need to have basic knowledge of Next.js before starting it. If you are new to this framework, please refer to the official documentation of Next.js. Here we go!

Automatic Image Optimization

Next.js 10 comes up with a built-in Image Component and Automatic Image Optimization. It has brought us the `next/image` Image Component, which is an extension of the HTML `<img>`.
Previously, we used to render the image somewhat like:

```
<img src="/new-image.jpg" width="800" height="800" alt="New Picture">
```

With Next.js Image Component, you need the following implementation:

```
import Image from 'next/image'
<Image src="/new-image.jpg" width="800" height="800" alt="New Picture">
```

The images are already lazy-loaded, which means users will only see the images when the image is close to been seen. It allows browsers to immediately render the space need for the image instead of having it jump in when loading, which prevents layout shift.

Talking about Automatic Image Optimization, Next.js next/image component automatically generates smaller sizes of images through built-in Image Optimization, which automatically serves the images in modern image formats like WebP, which is about 30% smaller than JPEG (if the browser supports it). Next.js 10 optimizes images on-demand as users make the request. The build times aren't increased whether shipping 10 or 10 million images.

Internationalization

The internationalization of a project has two main points: Translations and Routing. Many react libraries prepare your application to be translated, but most of them expect you to handle routing manually. So, ultimately, Next.js 10 brings the built-in support for internationalized routing and language detection.

Next.js 10 supports the two most common routing strategies: subpath routing and domain routing. For implementing both strategies, you start with configuring locales in `next.config.js`.

Subpath routing

In this strategy, you need to put the locale in the URL. That allows all languages to live on a single domain.

Let's take a look at how we can insert the locale in the URL.

```
`/en-us/article`  // For English
`/ja/artcile`     // For Japanese
```

Domain routing

In this strategy, you need to map a locale to a top-level domain. Let's take an example of `example.nl`, which can be mapped to `ja` locale, and `example.com` can be mapped to en locale.

The whole configuration for this type of routing is explained below:

```
//next.config.js

module.exports = {
     i18n: {
          locales: ['en', 'ja'],
          domains: [
               {
                    domain: 'example.com',
                    defaultLocale: 'en'
               },
               {
                    domain: 'example.ja',
                    defaultLocale: 'ja'
               }
          ]
     }
}
```

There are some more features like Language Detection and Search Engine Optimization that you can go through in Next.js docs.

Next.js Analytics

Vercel (Company of Next.js) says, "You can't fix what you can't measure." Knowing about the crucial roles that performance plays in the success of a product, Next.js 10 has presented Next.js Analytics. That is claimed to be the solution for tracking real-world performance metrics and feeding those insights back into your development workflow. Instead of measuring once, it will now measure continuously. Instead of measuring on your development device, measurements will come from the actual devices that your visitors are using. It is aimed to focus on the entire picture, deeply understanding your audience and how your application performs for your users.

Next Analytics allows capturing real-world insights instead of synthetic benchmarks. Also, it enables a continuous-stream of measurement instead of relying on occasional testing, ensuring that it's part of the developer workflow.
Please refer to the documentation for more, nextjs.org/analytics.

Next.js Commerce

Ecommerce has become the most important part for the users on the web. The Next.js 10 brings powerful new tools for e-commerce. They have released Next.js Commerce, the all-in-one starter kit for e-commerce sites, in collaboration with BigCommerce. Developers can clone, deploy and fully customize Next.js Commerce with few clicks.
Get more insights from the documentation, nextjs.org/commerce.

React 17 Support

There are no breaking changes for next.js in React 17 but some maintenance changes are required, like updating the peer dependencies.

All you need to do to start using React 17 is to upgrade Next.js and React with the following:

```
npm install next@latest react@latest react-dom@latest
```

Fast Refresh

When you make changes to your `getStaticProps` and `getServerSideProps` functions, Next.js will automatically re-run the functions and apply new data. This feature allows iterating quicker without having to refresh the page.

Importing CSS from Third Party React Components

Next.js 10 allows you to import third party CSS inside of React Components. That allows for code-splitting CSS that is meant for a single component. Hard to understand? Then let's take a look at react-datepicker library without needing to import the CSS in `app.js`:

```
import Datepicker from 'react-datepicker'
import 'react-datepicker/dist/react-datepicker.css'
```

Automatic Resolving of "href"

If you are the Next.js developer, before the introduction of Next.js 10, you might have run into a case to provide both `href` and `as` property to next/link. Similar to the following:

```
<Link href="/categories/[slug]" as="/categories/books">
```

Frequently developers forget to add `as` or find it tedious to write both every time, which causes problems in client-side routing. You no longer have to use `as` property for the majority of use-cases in Next.js 10. That removes the friction from the developer and improves the end-user experience.

Blocking fallbacks from "getStaticPaths"

The new `fallback: 'blocking'` mode for `getStaticPaths` enables the blocking behavior where no static fallback is sent to the browser. Instead, the initial request is waited on for pre-rendering.

```
export function getStaticPaths() {
     return {
          // enables blocking mode for the fallback behavior
          fallback: 'blocking'
     }
}
```

To learn about `fallback` behavior for incrementally generating additional static pages, you can refer to the documentation.

There are few more incredible features included in Next.js 10 that I am not mentioning in this article. With their exciting features, Next.js 10 has built up the real excitements for developers in development and users for user experience.

And Yes, Next.js 10 is actually 100% AWESOME!!

AADARSHA DHAKAL
CE Batch 2019

Writing Messenger Bot in DART

You may have used Dart language while writing mobile apps using flutter, or at least heard about it. Some of you might also have heard about Dart being used in the frontend by Google internally in products like Google Ads and Adsense. Do you know that we can also use Dart on the server-side? To show you the demonstration of Dart on the server, here I am going to create a messenger chatbot using Dart.

Getting things ready

First, you should have these things with you to get started.

1. A Laptop or Desktop
2. Good Internet Connection
3. Dart SDK installed in your device (Install it from here if not: https://dart.dev/get-dart)
4. Ngrok installed in your device (Install it from here if not: https://ngrok.com/download)

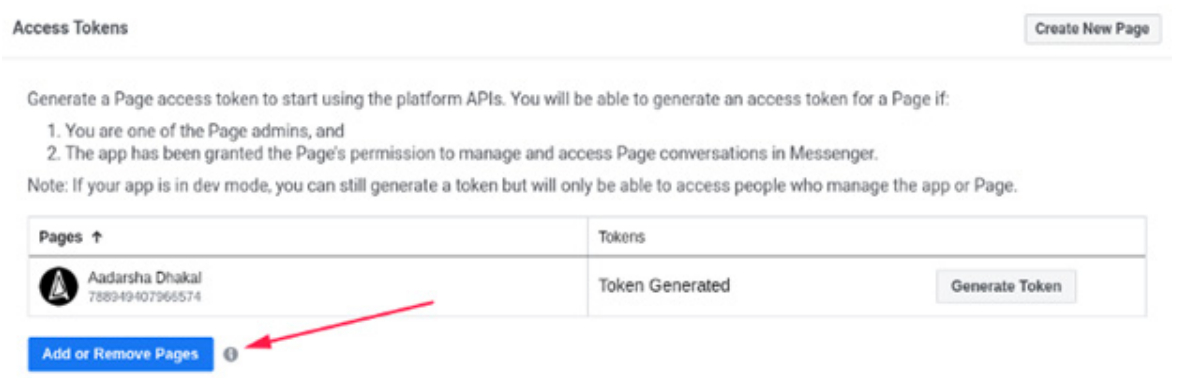
Once you have the basics requirements fulfilled, you can move to the next step.

Creating Facebook App

Let us begin by creating a Facebook App. To create a Facebook app, you must have a developer account, which you can create for free here: https://developers.Facebook.com/

Once you have created your Facebook app, we have to connect the app to your Facebook page. If you don't have a Facebook page, then you can create one.

Now, in the app dashboard, we have to set up a couple of products. First, you have to set up a Messenger product in your app. After that, we have to link our Facebook page to our app by clicking on the Add Pages button under the Access Token section.



We also have to set up webhooks, but we'll do that at last.

For now, we can move to the next step.

Creating a Dart Project

To create a simple Dart project, you can run this command in the terminal.

```
dart create <project-name>
```

This will create a project folder, which you can open with your favorite code editor. Keeping tooling and support in mind, I will recommend you to use VS Code.
Before we start writing code, we have to install a couple of dependencies. For that, open your `pubspec.yaml` file and update the dependencies list with these entries.

```
shelf_router:
dio:
```

We will use shelf_router package for writing our server and rest endpoints and dio packages for handling HTTP requests.
Now, run this command in the terminal to fetch dependencies.

```
pub get
```

Coding Time

Now comes the most exciting part of this tutorial. Finally, we can now write some Dart codes.
Open the <project-name>.dart file inside the bin directory of your project. First, we have to import the packages we're going to need.

```
import 'dart:convert';
import 'dart:io';
import 'package:bot/keys.dart';
import 'package:shelf_router/shelf_router.dart';
import 'package:shelf/shelf.dart';
import 'package:shelf/shelf_io.dart' as io;
import 'package:dio/dio.dart' as don;
```

Then inside the main method, which is the entry point of our program, write a few lines to create a Router object that comes from the shelf_router package and set up a simple web server server.

```
var bot = Router();
var server = await io.serve(
bot, '127.0.0.1', int.parse(Platform.environment['PORT']) ?? 8080);
```

Now, we have to create an endpoint that accepts POST and GET requests. Let's begin by writing a GET request handler, which will be used by Messenger Platform for handshaking.

```
bot.get('/', (Request request) {
if (request.url.queryParameters['hub.verify_token'] == <VERIFY_TOKEN>) {
return Response.ok(request.url.queryParameters['hub.challenge']);
} else {
return Response.ok('Hello! You are not authorized');
}
});
```

Here, <VERIFY_TOKEN> can be any string. But you have to remember this because we need this while setting up the webhook.

Now, let's create a POST request handler to handle Message Received Events from the webhook.

```
bot.post('/', (Request request) async {
     var payload = json.decode(
     await request.readAsString(),
     );
     var data = payload['entry'][0]['messaging'];
     for (var msg in data) {
          var text = msg['message']['text'];
```

```
        var sender = msg['sender']['id'];
        print('text: $text');
        print('sender: $sender');
        var reply = processMessage(text);
        print('reply: $reply');
        await sendMessage(
              reply: reply,
              recipient: sender,
        );
        }
  return Response.ok('Reply Sent!');
  });
```

This handler parses the event data and gets the sender id and the message text from it. Then we process the message text in the processMessage() function. The processMessage() function will return the reply text that we are going to send back to the Messenger Platform using the sendMessage() function.

So let's create a processMessage() function.

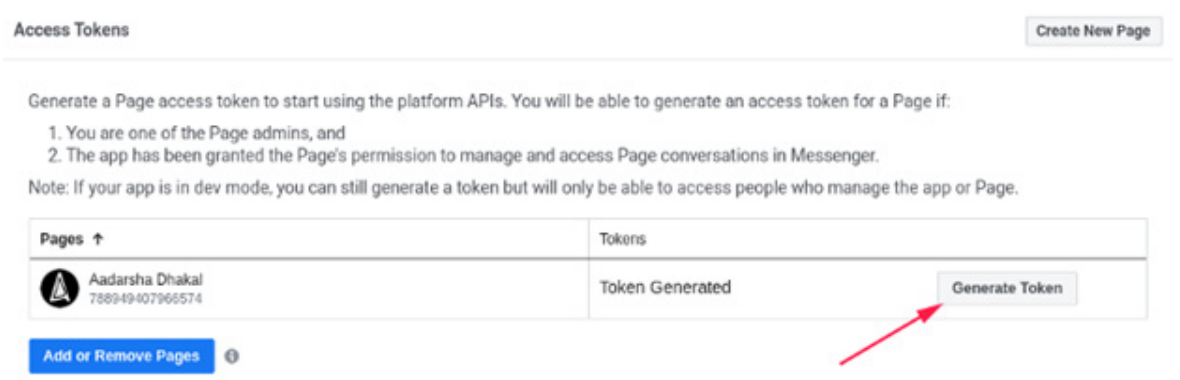
```
  String processMessage(String text) {
        String reply;
        switch (text.toLowerCase()) {
              case 'hello':
              reply = 'Hi! How can I help You ?';
              break;
              case 'how can i contact you?':
              reply = 'You can contact me via my email: aadarshadhakalg@gmail.com!';
              break;
              default:
              reply = 'I'll reach out to you soon! Thank you for messaging.';
        }
        return reply;
  }
```

And, sendMessage() function,

```
  Future<void> sendMessage({String reply, String recipient}) async {
        var dio = don.Dio();
        try {
        print('Recipient: $recipient');
        var requestData = {
              'recipient': {'id': recipient},
              'message': {'text': reply}
        };
  print('Request Data:  ${json.encode(requestData)}');
  var response = await dio.post(
        'https://graph.facebook.com/v9.0/me/messages?access_token=<PAGE_ACCESS_TOKEN>',
        data: json.encode(requestData),
        options: don.Options(
                    headers: {
                          'Content-Type': 'application/json',
                    },
              ),
        );
```

```
        if (response.statusCode == 200) {
            print('Success');
        } else {
            print(response.statusCode);
        }
        catch (e) {
            print(e.toString());
        }
    }
```

Here, we are sending a POST request to the Messenger Platform using the dio package. We have to pass the access_token query parameter. You can generate PAGE_ACCESS_TOKEN by clicking on the Generate Token button in the app dashboard under messenger settings.



Now, we have completed writing the codes. To start our server in the terminal, run the following command:

```
dart bin/<project-name>.dart
```

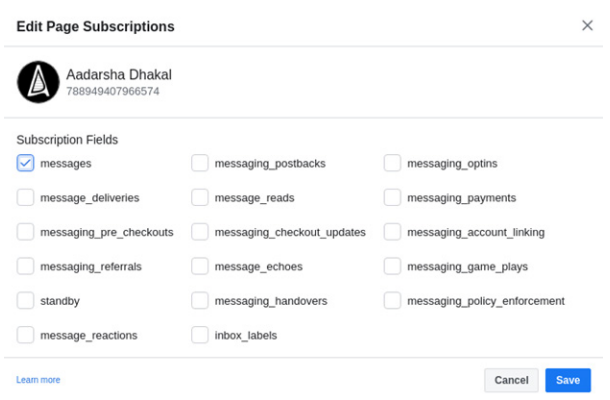
That will start a local server at port 8080. To make it accessible to the Messenger Platform, we have to use the ngrok tool. It allows us to expose our local webserver running on our local machine to the internet.

Run this command in the terminal and open the HTTPS version of the link provided by the ngrok,

```
ngrok http 8080
```

Okay, at last, we have to set up a webhook in our Facebook app. To do so, go to the app dashboard, to messenger settings, and under the webhook section, click on Add Callback URL and paste the URL you have copied from the previous step. Also, you have to provide the VERIFY_TOKEN. Remember the string we used while we were writing the GET method handler it should be the same.

Click on the Verify and Save button. If you are doing everything correctly, you will be able to see the Add Subscription button inside the Webhook section. Click on that and select the message checkbox and save it.



Voila! Your bot is now ready, and it will be working for sure.

Our bot is ready, but it's not as good as the one used in the real scenario. You can add a few more spices by using Natural Language Processing APIs before serving your bot to the public. Finally, you can deploy your app on a web server.

Thank you for making up to last. I hope this was not boring and you love it.

Message from the alumni

Sudeep Timalsina
Batch 2013
Computer Science
Wesionary Team, Japan/Kathmandu

"It was wonderful being at Kathmandu University for four years. It was time to shape the future. I have three-plus years of experience in Software Development as a Full Stack Software Engineer with React, GoLang, Node.js, Next.js, etc. All the credits of where I stand now belong to this place. I really miss the time I spent working with KUCC, IT Meet, and of course, our tours.

The thing I want to suggest to the aspiring undergraduates is, "Keep engaging yourselves in being updated with the technologies. The market is evolving so involve yourselves in learning more with semester projects. Also, participate in Dev Workshops and Meetups that generally happen in Dhulikhel."

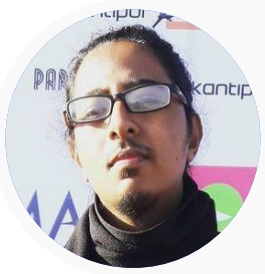
Shiwani Adhikary
Batch 2014
Computer Engineering
Deerwalk Services

"I joined Kathmandu University in 2014 when I was still exploring myself. During the four years in KU, I had lots of memories that I would cherish for a lifetime. I learned to be independent. KU gave me the strength to face the world. It taught me lots of valuable lessons and how each penny matters when it was the last week of the month.

Being a member of KUCC and taking part in the IT meet made me who I am. The journey from a volunteer to managing an event provided me with real-world experience, which is still helping me in my career.

I am already missing KU a lot, from those assignment deadlines to last-minute project submission, farewell to welcome, and most of all, hanging around with my friends. KU has helped me discover myself, and I will forever be grateful for it.

P.S. Batch 2014 rocks."



Yudeep Rajbhandari

Batch 2014
Computer Engineering
Software Engineer at Verisk Nepal

"The 4 years in KU was a rollercoaster ride. It was a fabulous experience, to say the least. Every day was a new adventure. That adventure was from classes to the internals to canteen food, enjoyments and celebrations with friends, "Manakamna ko chiya", welcome and farewell programs. I miss each and everything about KU. And like Barney said "Whatever you do in this life, it's not legendary, unless your friends are there to see it." So, to all the juniors reading this, try making some good friends and do something legend -wait for it- dary, Legendary!!
[while you still can :( ]."

Anurag Adhikari

Batch 2015
Computer Science
Security Analyst/Engineer, Sanima Bank Ltd.

"KU was the absolute best place where I got out from my comfort zone and that made me this capable. Those days were equally filled with joy, sadness, pain and that sense of fulfillment from every memory I got to spend. It was all worth it and I feel I am lucky to be an alumnus of KU. My experiences were mostly based on getting involved with various opportunities I got through KU. They really helped me grow a lot. And the experience with my friends where laughter and fun got rid of the stress we used to have.

I miss my friends, the fun at the hostel, daily evening walks to Dhulikhel Hospital, and the entire time I had at KU.

The advice which I want to give to the aspiring undergraduates would be "Never give up on your dreams. Push yourself as much as possible but do understand your limits. Give yourself as much time as possible to understand yourself and make the best out of it. Follow what you love and do what you want wisely."

Ashish Gyawali
Batch 2015
Computer Engineering
Software Engineer at Leapfrog Technology

The word Kathmandu University and DoCSE is blissfully planted inside me. When I think about it, all the memories make me smile; I lived my bachelor's life to the fullest.

During this student life, I learned some life lessons like leadership skills, handling the crowd, and gained many technical skills. Though some challenges were nerve-wracking, it is worth remembering now.

KUCC, IT Meet, and IT express made my bachelor's days more fulfilling with benevolence. Meeting new technically creative minds, exchanging ideas regarding academics with friends, and extra-curricular events and tea talks at Manakamana are the memories that flashback the most. So, each and every moment of a bachelor's degree time should be enjoyed to the fullest because, after that, maturity hits us hard.

Life will never be the same. You have to focus more on family, your career, and your future-self after that. However, the most important thing is your bachelor's shapes all these important stuff of life. It decides how successful you are going to be. So, enjoy your everyday life at KU by learning new skills and making memories but in a productive way so that you don't regret them in your future.

Suyog Adhikari
Batch 2015
Computer Science
EightSquare Infotrans

From staying up all night completing drawing sheets to staying up playing DOTA 2 with friends, I spent my 4 years at Kathmandu University. Aside from academics and acquiring practical skills, friendship and glorious memories are my prized possession acquired from this university. I'd be happy to go back in time and relive those moments again.

For you, it may seem like a normal day being an undergrad, but life will never be the same again once you graduate. So experience every precious moment while you still can.

Photo gallery

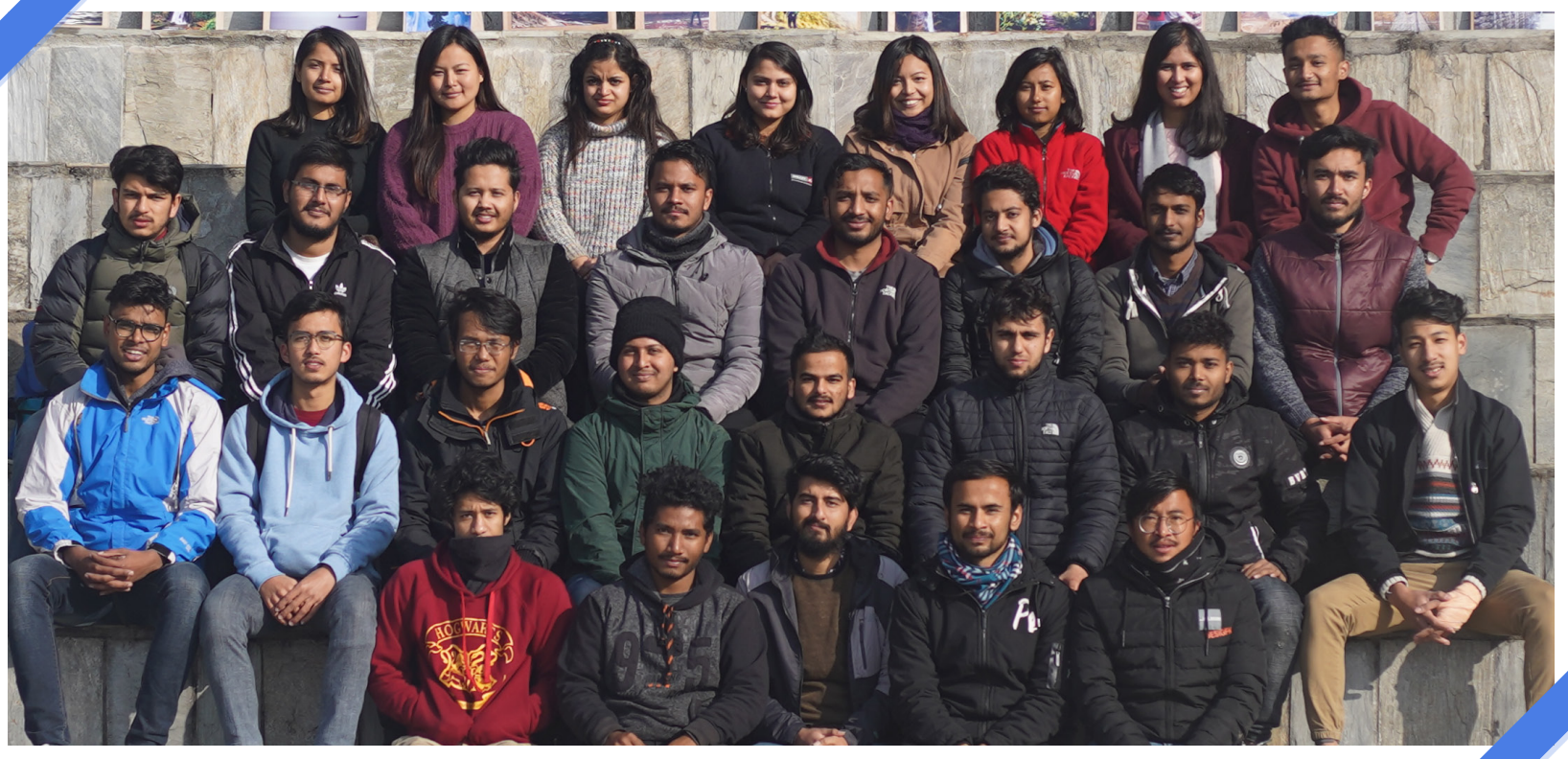
DoCSE teaching faculty

DoCSE non-teaching faculty

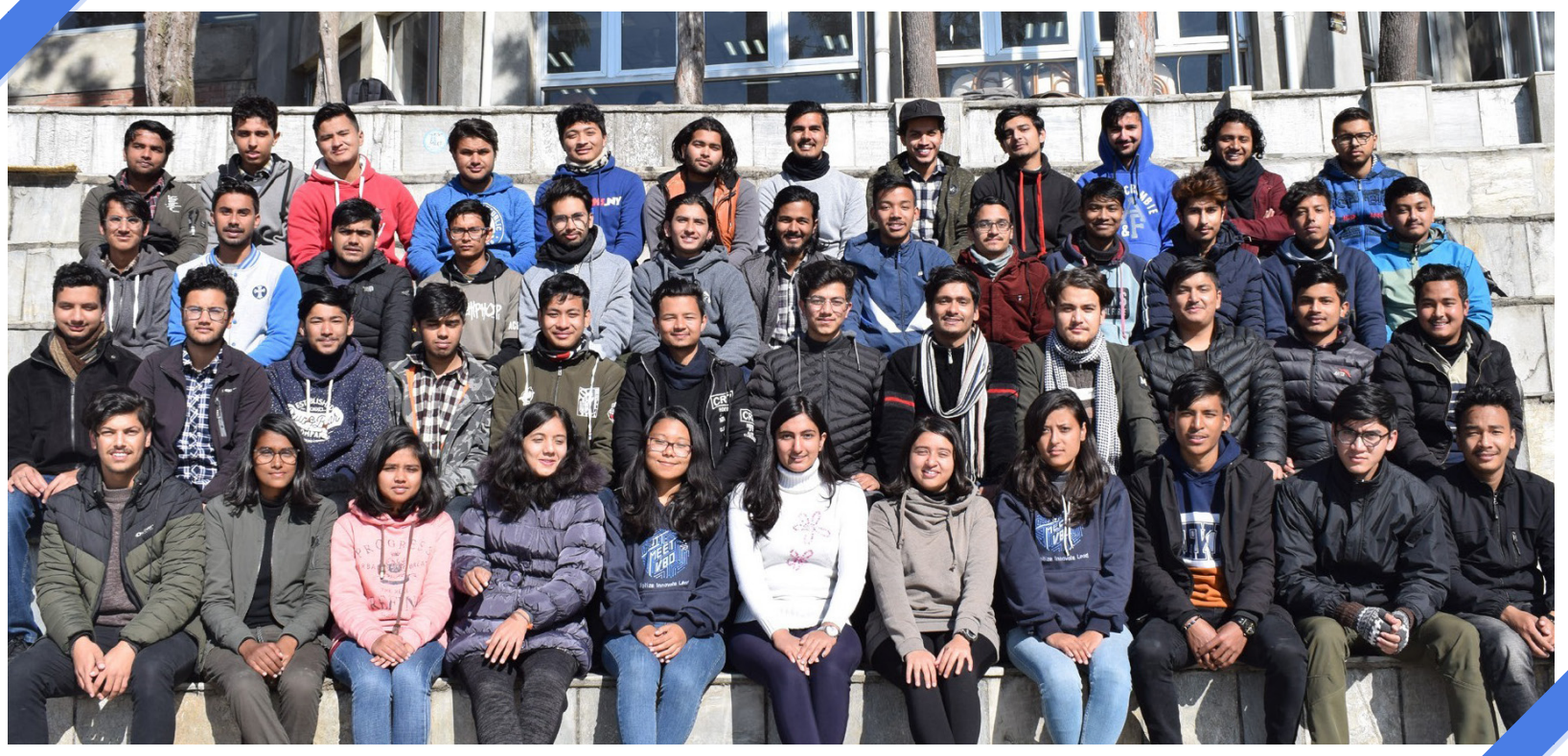
Master’s Batch of 2018

Master’s Batch of 2019

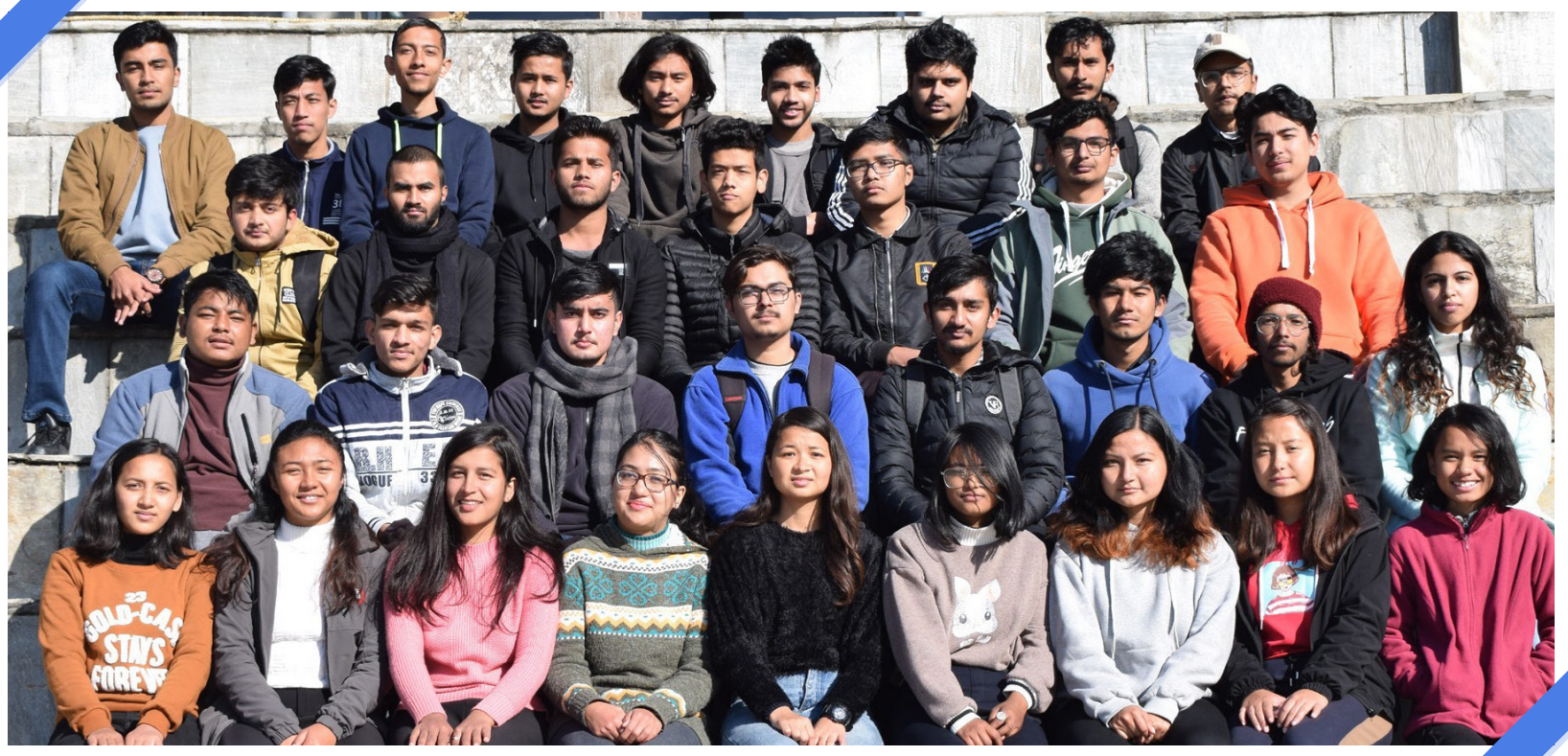
Computer Engineering | Batch of 2017



Computer Science | Batch of 2017



Computer Engineering | Batch of 2018



Computer Science | Batch of 2018

Computer Engineering | Batch of 2019

Computer Science | Batch of 2019

About IT Express

IT Express is the departmental magazine of Department of Computer Science and Engineering published annually under Kathmandu University Computer Club (KUCC). Every year, the magazine is released with a variety of contents, which holds different insights. Behind the successful release of the magazine resides intense amount of hard work and dedication showered by every individual involved as a member of the team. IT Express is not a trend, but a legacy, which we have been carrying since a long time back.

http://kucc.ku.edu.np/it-express