EY TECHNOLOGY PROPOSAL

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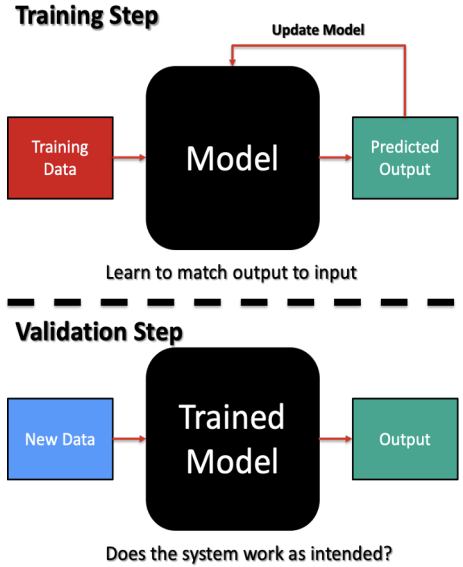
Objectives

- Desk bookings and allocations’ prediction.
- Secure storage of personal data.
- Using visualisation tools for vendor comparison.
- Monitor social distancing.

Technologies used

1. ***<u>Machine Learning (Supervised Learning) - Forecast desk bookings & allocations.</u>***

- Supervised Learning: Trained a system to understand a particular problem using subset of existing data, then it can be used to predict new upcoming data.
- Application: Regression.
- Horizontal-Axis: The distance to cafe/canteen in metres.
- Vertical-Axis: The length of joining EY.
- Advantage: The prediction can be shown via a “best-fit” regression line.



For a sample of n pairs of observations (x_i, y_i)

$$S_{xx} = \sum(x_i - \bar{x})^2 = \sum x_i^2 - \frac{(\sum x_i)^2}{n}$$

$$S_{yy} = \sum(y_i - \bar{y})^2 = \sum y_i^2 - \frac{(\sum y_i)^2}{n}$$

$$S_{xy} = \sum(x_i - \bar{x})(y_i - \bar{y}) = \sum x_i y_i - \frac{(\sum x_i)(\sum y_i)}{n}$$

A measure of linear association between two variables X and Y is given by the Pearson product - moment correlation coefficient r.

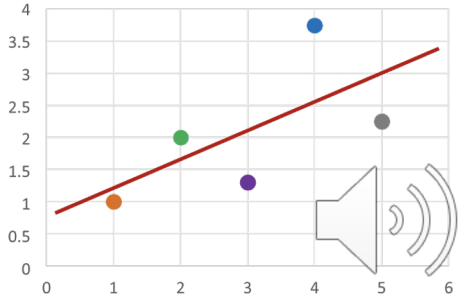
For the sample $(x_1, y_1), (x_2, y_2), \ldots, (x_n, y_n)$, it is given by $r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}}$.

Given data, the parameters α and β of the linear regression model may be estimated using the principle of least squares.

The least squares estimate $\hat{\beta}$ of the parameter β is given by $\hat{\beta} = \frac{S_{xy}}{S_{xx}}$.

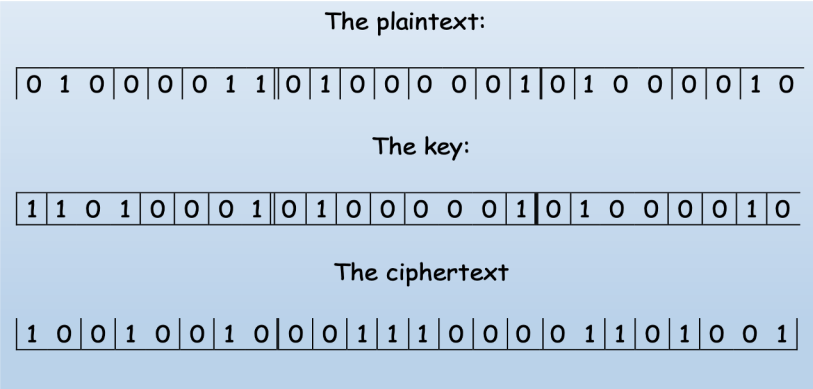
The least squares estimate $\hat{\alpha}$ of the parameter α is given by $\hat{\alpha} = \bar{y} - \hat{\beta}\bar{x}$.

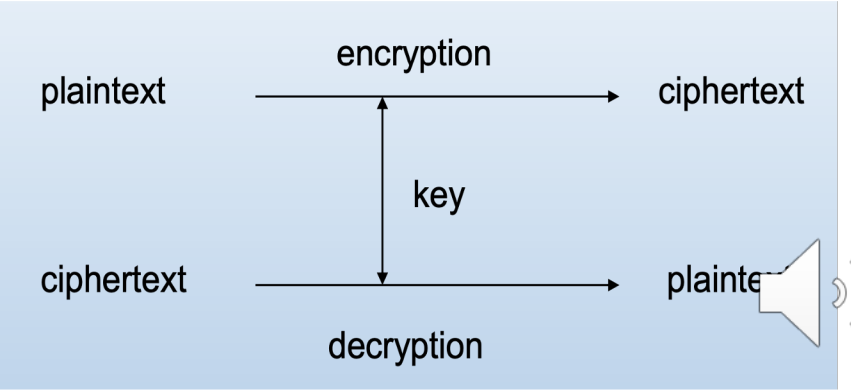
The least squares regression line is given by $y = \hat{\alpha} + \hat{\beta}x$.



2. ***Cyber Security (Cryptography) + Cloud Computing - Securely store personal data.***

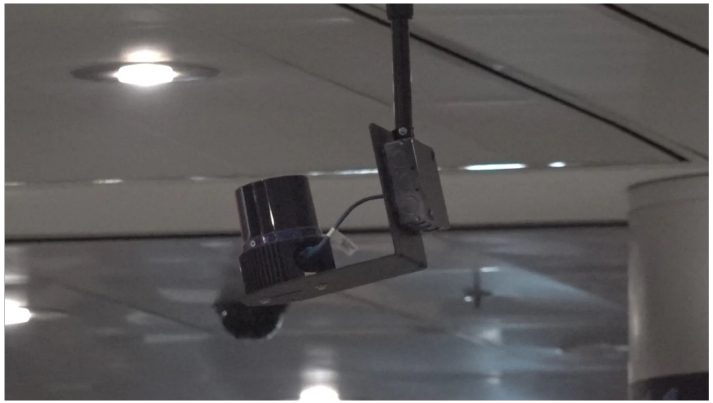
- Cryptography: The enabling technology to ensure that security properties are guaranteed.
- Cloud Computing: On-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user.
- Application: Encrypt all personal data into a cloud via Symmetric Cryptographic Algorithm.
- Using a single key for encryption/decryption.
- Ciphertext in the cloud, with the same size as plaintext.
- Block Cipher for conversion specifically.
- Advantage: Confidentiality, Integrity, Authentication, Nonrepudiation.

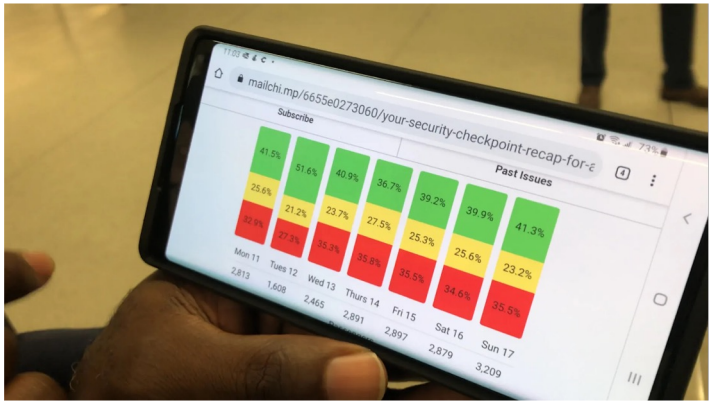




3. ***Artificial Intelligence (Model-based) - Monitor Social Distancing.***

- Model-based AI: Define an encoding of what the world looks like, how we can change that world, and search for good strategies on how to change the world the way we want to.
- Application: Video-Based people-tracking software => smart camera.
- Treat every single person as a dot and localise them.
- Advantage: The social distance measurement can be modelled based on how traffic lights work on the road.
- Alarm will get triggered if the “red portion” is above a threshold, can be announcement-based.





Vendor Comparison

KEY:
- ● Available – standard functionality
- ○ Available – limited existing functionality available

	Visualisation Tool Comparison		
	Microsoft Power BI Tool 1	Tableau Tool 2	Google Charts Tool 3
On Premise / Cloud based	●	●	○
Data limits for direct data upload	○ 1 GB limit per dataset	● no enforced limit	● no limit for data size the way you draw matters 5000 pixels maximum
Data cleansing tools	○	● Tableau Prep Software	○
Drill down capabilities	●	●	●
Data exporting (Excel and PowerPoint)	●	●	●
Mobile compatibility	● compatible with iOS, Android & Windows	○ still under deployment	● compatible with Android & iOS
Integration with Information systems	● with OutSystems	● With Tealium	● with ASP.NET Web form
Integration with programming software	● with Tidal Software	● with TabPy for Python Integration	○

Summary

- Desk bookings and allocations' prediction.

  => solution: use linear regression: length of joining EY vs distance to cafe/canteen.

  => pro: predict a piece of data via the line of best fit/mathematical calculation.

- Secure storage of personal data.

  => solution: use Symmetric Cryptographic Algorithm to encrypt all personal data into a cloud.

  => pro: Confidentiality, Integrity, Authentication, Nonrepudiation.

- Using visualisation tools for vendor comparison.

  => solution: use Microsoft Power BI, Tableau and Google Charts.

  => pro: provide quick access to meaningful business insights.

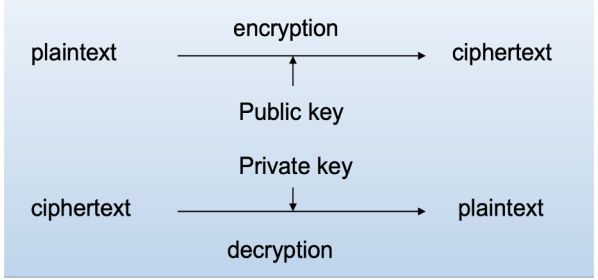
- Monitor social distancing.

  => solution: use video-based smart camera to track people.

  => pro: can be monitored using a road traffic light system.

Risks & Issues

- ***Regression for Supervised Learning:***
  - Not very effective if outliers appear. => Try Curvilinear Regression instead.
- ***Cyber Security + Cloud Computing:***
  - Only one key exists so employees can still view the personal information of each other once they access the cloud. => Need a stronger and more secure encryption algorithm: Asymmetric Cryptographic Algorithm.



- ***Smart camera for Model-Based Artificial Intelligence:***
  - Only models individual, not very accurate for family/friend groups.
- ***Using Visualisation Tools:***
  - Lack of understanding of the tools/dataset before using it.

References

- Foxnews. 2021. Exclusive look airports embracing an influx of passengers with new social distancing technology. [online] Available at: <https://www.foxnews.com/travel/exclusive-look-airports-embracing-an-influx-of-passengers-with-new-social-distancing-technology>
- En.wikipedia.org. 2021. Cloud computing. [online] Available at: <https://en.wikipedia.org/wiki/Cloud_computing>
- IBM. 2021. Cloud computing. [online] Available at: <https://www.ibm.com/cloud/learn/cloud-computing>
- IBM. 2021. Cryptography concepts. [online] Available at: <https://www.ibm.com/docs/en/i/7.4?topic=cryptography-concepts>
- Guru99. 2021. Best data visualisation tools. [online] Available at: <https://www.guru99.com/best-data-visualization-tools.html>
- Community.powerbi. 2021. Power BI as a data cleaning tool. [online] Available at: <https://community.powerbi.com/t5/Desktop/Power-BI-as-a-data-cleaning-tool/m-p/682927>
- Powerbi.microsoft. 2021. Drill down. [online] Available at: <https://powerbi.microsoft.com/en-us/blog/tag/drill-down/>
- Powerusers.microsoft. 2021. Export Power BI data to excel via power automate. [online] Available at: <https://powerusers.microsoft.com/t5/Building-Flows/Export-PowerBI-Data-To-Excel-Via-Power-Automate/td-p/750606>
- Docs.microsoft. 2021. Mobile apps for mobile devices. [online] Available at: <https://docs.microsoft.com/en-us/power-bi/consumer/mobile/mobile-apps-for-mobile-devices>
- Workato. 2021. Out systems plus Microsoft Power BI. [online] Available at: <https://www.workato.com/integrations/out_systems+microsoft-power-bi>

- Community.powerbi. 2021. Integrating Tidal Software with Power BI. [online] Available at: <https://community.powerbi.com/t5/Report-Server/Integrating-Tidal-Software-with-Power-BI/m-p/1868018>
- Kb.tableau. 2021. Maximum limit for rows or columns of data. [online] Available at: <https://kb.tableau.com/articles/howto/maximum-limit-for-rows-or-columns-of-data>
- Tableau. 2021. What is data cleaning. [online] Available at: <https://www.tableau.com/learn/articles/what-is-data-cleaning>
- Help.tableau. 2021. Admin mobile intro. [online] Available at: <https://help.tableau.com/current/mobile/mobile-admin/en-us/admin_mobile_intro.htm>
- Tealium. 2021. Tableau. [online] Available at: <https://tealium.com/integrations/tableau_tableau.php>
- Tableau. 2021. Data science integration. [online] Available at: <https://www.tableau.com/developer/data-science-integration>
- Stackoverflow. 2021. Google Charts input data size limit. [online] Available at: <https://stackoverflow.com/questions/29960524/google-charts-input-data-size-limit>
- Groups.google. 2021. Google Visualisation API. [online] Available at: <https://groups.google.com/g/google-visualization-api/c/5bnCXUms7jo/m/x-6VJ_7VVC4J?pli=1>
- C-Sharpcorner. 2021. ASP.NET Webform Google Charts API integration. [online] Available at: <https://www.c-sharpcorner.com/article/asp-net-webform-google-charts-api-integration/>
- Upgrad. 2021. Benefits of data visualisation. [online] Available at: <https://www.upgrad.com/blog/benefits-of-data-visualization/>
- Jisc. 2021. Potential risks related to data visualisation. [online] Available at: <https://www.jisc.ac.uk/guides/data-visualisation/potential-risks-related-to-data-visualisation>