



Centre For Innovation

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Centre for Innovation (CFI)
Indian Institute of Technology Madras
Application for the Post of Coordinator
Analytics Club (2022-2023)

Name:	Nick:	
Roll:	Room:	Hostel:
Phone:	CGPA:	Email:

Instructions and Conditions:

1. The applications have to be submitted in PDF format with the subject as "CFI_Analytics_Coordinator22-23_<your name>_<roll number>".
2. Attach your grade card (screenshot) and the application in the same mail.
3. You may submit the completed application through this [form](#) before **11:59 PM, 3rd May 2022**.

Note

- a) The entire application **should not exceed ten pages (excluding the three pages)**.
- b) Be concise and to the point. Bullet points are preferred over sprawling paragraphs.
- c) The number of ideas does not matter if not appropriately validated. Each idea should be thoroughly thought through before being included in the application.
- d) Your very own CFI legend has begun. Please make sure you have fun along the way. All the best.
- e) Make sure to **attempt all the compulsory questions** even if you aren't confident that it's correct.
- f) Have a look at the [FAQ Document](#). If you still have any queries, you can reach out to the core team:

Archish S: [84383 22870](#)

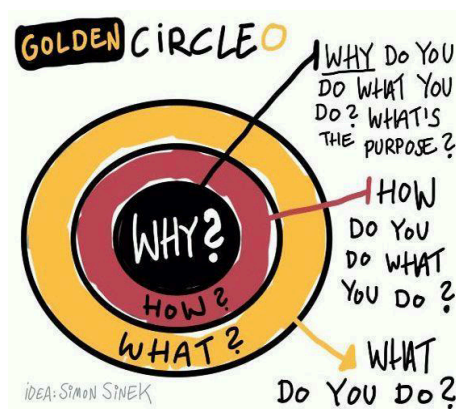
Abhiram G: [96766 17070](#)

Vinayak Gupta: [95001 80979](#)

Kamalesh Kumar: [93449 00859](#)

Guru Shreyas: [86109 33677](#)

The key to any successful undertaking is to understand the Golden circle. Please answer all questions below after giving this a thought.





Questionnaire

Section A: Managerial Questionnaire:

- 1. Essentials:** As an aspiring coordinator for the club,
 - a. State your motivation to become an Analytics club coordinator. What do you feel makes you a decent fit for this job? Justify by stating your skills/strengths and previous experience (if any). (Explain why you're choosing AI/ML not just for the sake of a PoR but out of interest.)
 - b. What will your role and responsibilities as a coordinator be in the coming tenure? (NOTE: Frame your answer from the perspective of an offline/hybrid tenure)
 - c. Give us a brief description of the various managerial teams in CFI and how you would be working together with them.

- 2. Club Sessions/Events/Projects:** Organizing club sessions for the student body will be a vital part of your tenure as a coordinator. Keeping that in mind,
 - a. Suggest new ideas for club sessions (see the past sessions [here](#)), competitions and events. Looking at the past sessions of the club, what changes would you suggest?
 - b. What are your views on the projects taken up by the club this year? Which project interests you the most and why? What problem statements outside of the projects would you be interested in pursuing during the tenure?
 - c. As a coordinator, how would you ensure that every project member feels valued in the club and is actively involved in the project throughout the year?

- 3. PR/Publicity and Networking:**
 - a. Specify the importance of PR for the club. How would you increase the visibility of the club's initiatives across the student body? Hint: Instagram page, Newsletter?
 - b. Suggest ways to maximize participation and interaction in a club session/events.

- 4. Commitments/PoRs:** Weekly, how much time do you think you will be able to commit to this PoR? What other PoRs/activities do you plan to take up next year? In case of clashes, how will you prioritize your role as a coordinator?



Section B: Technical Questionnaire:

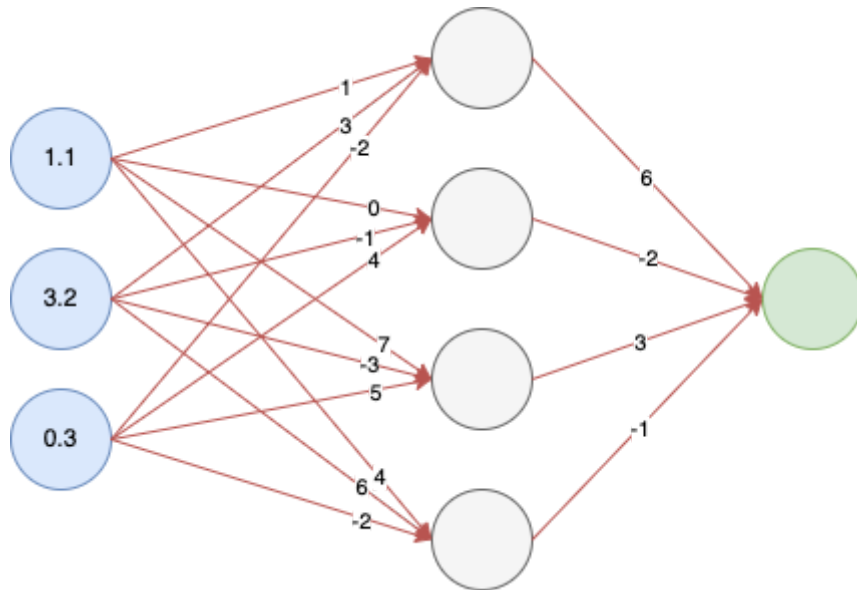
1. Basics: Let's touch upon some common terms in ML.

- a. *Bias*, and *Variance* are commonly used in ML/DL. *Bias* and *Variance* are typically encountered after the experiment is finished and when we perform the analysis of our results. Based on your understanding of *Bias* and *Variance*, answer the following questions:
 - i. Explain the trade-off between **Bias** and **Variance**.
 - ii. What do you think is better to achieve **high Bias** or **high Variance**? Discuss the scenarios in which **high Bias** and **high Variance** are required.
- b. **Normalization** is a technique we perform to ensure that the values between the operations do not blow up and always remain within a specific range.
 - i. Explain how **Normalisation** works. How does normalization behave differently in the training and inference phase?
 - ii. State and briefly explain the different Normalization techniques available and describe when batch normalization is useful.

2. Neural Networks are computing systems that are a collection of nodes, called neurons, each connected to other nodes, similar to synapses in the brain. Typically, Neural Networks consist of an input layer, one or more hidden layers, and an output layer, which are collections of the nodes connected through edges. The following image depicts a simple neural network with three layers - **input**, **hidden**, and **output** and weights of the **edges**. Often, each layer additionally consists of activations to mimic the stimulation of a neuron. With suitable assumptions, Compute

- a. The output at each neuron - **hidden layer** and **output layer**. Elaborate on the assumptions you made.

If the **hidden layer** has a *ReLU activation* and the **output layer** has a *sigmoid activation*, recompute the outputs at each neuron.
- b. While training the neural network, the weights of the **edges** are updated accordingly to 'fit' the output characteristics. We define the Cost function or the Loss function, representing how well the model performs. Think about (i) how the weights at each neuron get updated during training and (ii) how the loss function output changes with time.



3. Optional: But brownie points for answering this xD!

Convolutions are widely used in image processing and are prominent in deep learning. Convolution is a mathematical function that operates on two functions, in this case, matrices. The following image depicts a convolution operation, where the matrices are of order 5 and 3, respectively. With suitable assumptions, Compute

- The resulting function. Elaborate on the assumptions you made to arrive at this result.
- The operating function, i.e., the 3x3 matrix, is the kernel. Discuss the specialty of the particular kernel used.

$$\begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 4 & 4 & 4 & 1 \\ 1 & 4 & 1 & 4 & 1 \\ 1 & 4 & 4 & 4 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} \otimes \begin{bmatrix} +1 & 0 & -1 \\ +2 & 0 & -2 \\ +1 & 0 & -1 \end{bmatrix}$$