UNIVERSIDAD NACIONAL DE COLOMBIA
SEDE BOGOTÁ

FACULTAD DE INGENIERÍA
Vicedecanatura Académica
POSGRADOS

PROPOSAL SUBMISSION

DOCTORAL THESIS:	[x]	MASTER THESIS:	[ ]
MASTER FINAL WORK:	[ ]	SPECIALIZATION FINAL WORK:	[ ]

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2. **PROGRAM:** Phylosophy Doctoral in Computer Science and Systems Engineering
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4. **TITLE: Kernel Tensor Factorization**
5. **AREA:** Computer Science
6. **LINE OF RESEARCH:** Machine Learning
7. COMMENTARY WITH ADVISOR APROVAL aspectos: organización, pertinencia, relevancia y originalidad).
8. BIDDER SIGNATURE
9. SIGNATURE OF ADVISOR

Contents

1 Basics of the tensor decomposition

1.1 Formulation for tensor completion

Following Ji Lu et. al notation
low rank matrix completion

$$\begin{aligned} &\min_X \operatorname{rank}(X) \\ &\text{s.t. } X_\Omega = M_\Omega \end{aligned} \tag{1}$$

where Ω is an index set, then X_Ω is coping entries of X in the indexes Ω and missed entries $\hat{\Omega}$ would be 0

The missing entries in X are determined in order to minimize the matrix X rank. i.e. a non convex optimization problem since rank is nonconvex.

Frequently, trace norm (or nuclear norm) $||\cdot||_*$ is used to approximate the rank of matrices. Trace norm is the tighest convex envelop for the matrices rank.

$$\begin{aligned} &\min_X ||X||_* \\ &\text{s.t. } X_\Omega = M_\Omega \end{aligned} \tag{2}$$

Since tensor is a generalization of the matrix concept, we generalize the optimization problem as

$$\begin{aligned} &\min_{\mathcal{X}} ||\mathcal{X}||_* \\ &\text{s.t. } \mathcal{X}_\Omega = \mathcal{M}_\Omega \end{aligned} \tag{3}$$

1.2 Tensor probability

Given a sample set

achievement of the project activities, including successful completion of the tasks and timely production of deliverables. resource accounting. It will also be in charge of managing the relations with collaborating institutions and administrative bodies within. stage before delivery hand over to ensure compliance and coherence. Also, it will follow up project progress anticipating corrective actions and assessing risk mitigation actions.