DICA-016-2020
Santiago de Cali, 9 de julio de 2020

EL DECANO DE LA FACULTAD DE INGENIERÍA Y CIENCIAS
INFORMA QUE:

En el periodo 2020-1 (enero-junio) se dictaron los cursos que se relacionan a continuación, para los estudiantes del Doctorado de Ingeniería y Ciencias Aplicadas de la Pontificia Universidad Javeriana Cali, en el marco del Programa Ómicas:

Asignatura	Profesores
Análisis Probabilístico y Estadístico	Isabel García
Bioinformática	Mauricio Quimbaya y Fabián Tobar
Biología Celular y Molecular I	Mauricio Quimbaya
Biotecnología	Mauricio Quimbaya
Bases Matemáticas para no Ingenieros	Andrés Salazar
Química y Física de Materiales	Drochss Valencia
Matemáticas Discretas	Diana Bueno
Ciencia e Ingeniería de Nanoescala	Andrés Jaramillo
Verificación de Sistemas	Camilo Rocha y Camilo Rueda
Análisis de Redes para Grandes Volúmenes de Datos	Jorge Finke
Aprendizaje Automático	Diego Luis Linares
Bases Formales de la Computación	Frank Valencia

Cordialmente,

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Syllabus: Graph Analytics for Big Data
Instructor: Jorge Finke

Overview

The universe is a massive system of systems. Examples of such real-life complex systems are critical man-made infrastructure systems such as the Internet, electric power systems, gas networks, transport industries, and data networks. Complex systems theory is a new interdisciplinary approach to understanding dynamic processes involving the interaction of many agents. This course offers an introduction to the essential concepts of complex systems theory, applied to engineering, physical, biological and even social systems. It presents a set of mathematical methods and simulation strategies as a unifying approach to untangle the complexity of these type of systems.

Throughout the course we will pay particular attention in choosing the right level of detail for the model, testing its stability and robustness properties, and discussing which questions a given model can and cannot answer. While the course introduces basic analytical tools for a variety of models, computer simulations are also used to discover emergent properties of such models, thereby gaining insights into dynamic processes that would be too difficult to model with standard mathematical techniques. The goal is to discover new principles about the dynamics of systems that are typical of engineering processes. In studying complex systems we will introduce the use of network topologies and their characterization, including concepts such as small worlds, degree distribution, diameter, clustering coefficient, and modules.

Requirements

Some background in dynamic systems is highly desirable. Students interested in large-scale real-life complex systems and new research challenges will gain from taking this course. The course is intended for graduate students in a wide variety of engineering and other fields, not just electrical engineering.

Schedule

Week	Lectures
1	Introduction to information networks
2	Common structural properties (part 1)
3	Common structural properties (part 2)
4	Common structural properties (part 3)
5	Network visualization tools
6	Generalized random graphs
7	Small-world graphs
8	Scale-free networks
9	Models of network growth
10	Percolation theory and network dynamics
11	Epidemic processes on networks
12	Dynamics on networks
13	Course review
14	Project presentations

For more details and content see:https://jfinke.org/graph-analytics/

Grades

Assignment	Percentage
Project 1	30%
Project 2	30%
Project 3	30%
Final presentation	10%