



POLITÉCNICA



E.T.S. DE INGENIERÍA AGRONÓMICA,
ALIMENTARIA Y DE BIOSISTEMAS

Título de las prácticas/*Practice Title:*

Modeling epistasis and conditional selection on cancer driver mutations

Descripción de las funciones del alumno/*Description of student functions*

The student will join a transdisciplinary research group that investigates the evolutionary dynamics of genomes, viruses, and microbial populations by combining computational models and comparative (meta)genomics. The student will develop a computational model of cancer evolution aimed at studying the effects of epistasis and conditional selection on the accumulation of driver and passenger mutations. By exploring alternative evolutionary scenarios, this simulation study will help interpret some results on cancer genomics previously obtained by the group. The student will also participate in group meetings and discussions aimed at developing her/his science communication skills in a multidisciplinary environment.

Requisitos: *(indicar titulación y curso); otros requisitos adicionales (idiomas, informática, otros conocimientos, etc)/ Required formation and skills of the student*

Computational Biology Master student with strong computer programming skills (Python, C++, Matlab, etc). Familiarity with modelization and simulation of dynamical systems. Basic knowledge of linear algebra, calculus, statistics, and numerical methods is highly desirable.

Proyecto formativo/*Student Formation Program*

Módulo PRACTICAS EXTERNAS. El objetivo fundamental de las Prácticas Externas es guiar al alumno para que aplique en el mundo real los conocimientos que ha adquirido previamente en un entorno de trabajo en grupo que reproduzca de una manera realista las condiciones que se puede encontrar en su futuro lugar de trabajo. El estudiante podrá familiarizarse con el mundo laboral (horarios, responsabilidad, actitud, organización, etc), y con la metodología de trabajo adecuada a la realidad profesional, contrastando y aplicando los conocimientos académicos adquiridos.

EXTERNAL PRACTICE module. The fundamental objective of the External Practices is to teach the student to apply in the real world the knowledge that he has previously acquired in a group work environment that reproduces in a realistic way the things that can be found in his future place of work. The student can become familiar with the working world (schedules, responsibility, attitude, organization, etc.), and with the work methodology appropriate to the professional reality, contrasting and applying the academic knowledge acquired.

Actividades a desarrollar en la práctica académica/*Activities to carry out during the academic practices*

The general goal of these academic practices is to provide the student with a comprehensive overview of scientific research in the context of a transdisciplinary study of the microbiome. The student will be involved in data collection and analysis, computational modeling based on the real data, hypothesis testing, and dissemination of results. The student will perform the following



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specific tasks, with the support of the supervisor:

- 1) Review of bibliography regarding models of mutation accumulation during tumorigenesis.
- 2) Design of a suitable model that includes the effect of epistasis through conditional selection on cancer driver mutations.
- 3) Simulation of the model in different evolutionary scenarios (e.g. by modifying mutation rates, fitness effect of passenger mutations, and cell population size).
- 4) Comparison of the model results with empirical estimates of conditional selection in cancer genomes. In the light of this comparison, assessment of the role that different evolutionary factors play on the accumulation of driver and passenger mutations in real tumors.
- 5) Realization of the "Trabajo de Fin de Master". Time and results permitting, the student's report should contribute to a future manuscript that will be submitted to an international research journal.

Besides the specific skills required to accomplish these goals, the student will acquire transversal skills in oral communication, scientific writing, and critical thinking.

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| Nº de plazas: | 1 |
| ¿El alumno tendrá trato habitual con menores? | No |
| Fecha de inicio: | 1/2/2021 |
| Fecha de fin: | 1/7/2021 |
| Horas semanales: | 25 |
| Horario jornada laboral: | A convenir |
| Importe Ayuda/Bolsa de estudio: | €/mes |
| Tutor académico: Email: | Jesús Israel Pagán Muñoz jesusisrael.pagan@upm.es |
| Departamento tutor académico: | Biotecnología – Biología Vegetal |



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| Tutor empresa: | Jaime Iranzo Sanz |
| Email tutor empresa: | jaime.iranzo@upm.es |
| Departamento tutor empresa: | CBGP |
| Ubicación de la estancia de las practicas | Campus Montegancedo - UPM |
| ENTIDAD COLABORADORA: | UPM |
| A cumplimentar por Oficina Prácticas ETSIAAB: | |
| Créditos a reconocer (Nº ECTS): | |

Enviar por email a: OFICINA DE PRÁCTICAS ACADÉMICAS EXTERNAS – ETSIAAB
secretaria.pei.etsiaab@upm.es – Secretarias: Visitación Pérez / Susana Pardo - Tfno: 913363686)