C NTRA

Computational Oncology Training Alliance

ESR 7 - Inferring tumour Evolution and Migration

Research project	Metastasis formation is the main cause of cancer-related death. Cancer cells that leave the primary tumour tissue and enter the blood circulatory system are referred to as circulating tumour cells (CTCs). While extremely rare, they represent an opportunity for minimally invasive biopsies. Recent advances in microfluidics technologies have allowed the isolation of viable human CTCs, revealing unexpected features, such as the existence of oligoclonal CTC clusters in addition to single CTCs. CTC clusters represent highly efficient metastatic precursors, but their evolutionary relationship to the primary tumour and possibly to existing metastases is unknown. Using single-cell, parallel exome and transcriptome sequencing data from breast cancer CTCs we will develop computational methods for inferring the migration and evolutionary history of CTC clusters and of single CTCs.
Supervisor	name Niko Beerenwinkel e-mail niko.beerenwinkel@bsse.ethz.ch website www.cbg.ethz.ch
Host institution **ETH**zürich	ETH Zurich Department of Biosystems Science and Engineering Basel, Switzerland
PhD program	Life Science Zurich Graduate School (http://www.lifescience-graduateschool.uzh.ch/en.html)
Expected results	1) Mathematical framework for tumour evolution and migration 2) Computational method for inferring evolutionary and migration histories from primary tumour, metastases, single CTCs and CTC clusters
Planned secondments	1) UNIWARSAW/Szczurek to work on metastasis formation and tumour cell migration (3 months) 2) UVIGO/Posada to work on migration (3 months)
Required profile	Strong background in mathematics, statistics, computer science, bioinformatics, or a related field; experience with phylogenetic model building is a plus