Algorithms for Tumor Phylogenetics

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Tumorigenesis: (i) Cell Mutation

Clonal Theory of Cancer
[Nowell, 1976]
Tumorigenesis: (i) Cell Mutation, (ii) Cell Division

Clonal Theory of Cancer
[Nowell, 1976]
Tumorigenesis: (i) Cell Division, (ii) Mutation & (iii) Migration

- Primary Tumor
- Brain Metastasis
- Liver Metastasis
Precise mathematical models are needed to describe the evolutionary process in cancer
Bigger Picture

‘Nothing in biology makes sense except in the light of evolution.’

• Large-scale comparative tumor phylogenetics to identify common patterns of tumor evolution: *Landscape of tumor phylogenies.*

• Algorithms and translatable model systems to uncover spatiotemporal dynamics of tumorigenesis.

• Novel algorithms to study the interplay of intra-tumor heterogeneity, the microbiome and the immune environment.

• We should be treating tumor clones rather than individual mutations.