Day 2: Key Concepts

Lecture 3: Visualizing Therapeutic Signals

► The development of a Green’s function provides a general and powerful means to predict optical distributions for arbitrary source configurations.

► An increase in refractive index mismatch enhances total internal reflection and increases the fluence rates and optical penetration within the tissue. (It also reduces the reflected/transmitted signal and narrows your view of the angular variation of the light field within the tissue)

► The SDA provides poor predictions of the internal fluence rates and optical depths for $(\mu'_s/\mu_a) \lesssim 30$.

► Finite beam diameters further reduce optical penetration/dose depths; especially for highly scattering media.
Day 2: Key Concepts

Lecture 4: Modeling Diagnostic Signals

➤ The restriction of measurements to the tissue boundary creates computational challenges for diagnostic applications.

➤ One must design measurements that (a) have sufficient independence from one another and (b) provide signals that are sensitive to the physiological changes you wish to detect.

➤ The derivative of the measured signal (expressed as a weighted integral of the product of radiance with a detector function) with respect to optical properties provides key information.

➤ Ill-conditioned inverse problems should be anticipated.
Day 2: Key Concepts

Lecture 5: Analyzing Diagnostic Signals

- Convolution of RTE/SDA Green’s function with optical source configurations provides a powerful means to predict diagnostic signals.

- The design of detector placement in phase space (position, angle, time, wavelength) affects its sensitivity to tissue absorption and scattering.

- The phase space location of detectors also impacts the tissue volume that is ‘interrogated’ by the measured signal.

- ‘Interrogation’ Density maps provides a framework to understand the efficacy with which a given source-detector pair interrogates specific subvolumes within a tissue.