# Neural Network for Coated/Uncoated Hydrosol Particles

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## Why Neural Network

- Accurately reproduce inherent optical properties (IOPs) for coated/uncoated hydrosol particles while reducing required disk space by 100x
- Provide IOP properties at least 100x faster than the advanced look-up-table

## Network Information

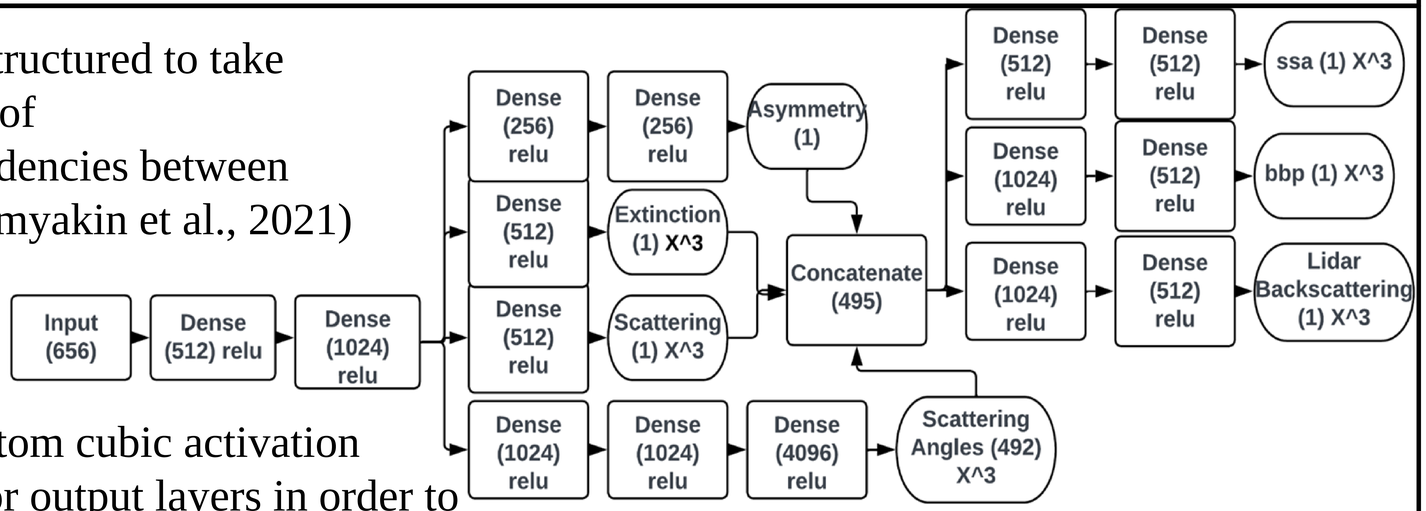
- Coated/uncoated hydrosol particle network:
  - Size: 150 MB
  - Speed: ~ 5,000-10,000 cases/second
- Input parameters: wavelength, real and imaginary components of the core and shell, (imaginary shell consists of 650 values), effective radius, effective variance
- Output parameters: extinction coefficient, scattering coefficient, absorption coefficient, lidar backscatter coefficient, bbp, asymmetry parameter, scattering matrix

## References

Chemyakin et al., 2021, Improved Lorenz-Mie Look-Up Table for Lidar and Polarimeter Retrievals. Frontiers in Remote Sensing, 2, p.711106.

## Network Structure

- Network structured to take advantage of interdependencies between IOPs (Chemyakin et al., 2021)
- Uses a custom cubic activation function for output layers in order to produce more accurate results through a wider range of output values




## Network Performance