E:\Paper\First Author Papers\Interface 2019\Figures\Updated Figure\SD_Figure_1.tif

**Figure S1:** Parametric images of relative blood flow (RBF) in a GD18 rat placenta generated from our pixel-wise TIC analysis (a), and from TICs fit after averaging the CEUS signal in 2x2 (b), 4x4 (c), and 8x8 (d) sized kernels overlaid on B-mode US images of anatomy. The mean RBF (shown on a log scale) and normalized variance decrease with increasing kernel size. The parametric images show the loss of spatial variation due to averaging in the larger kernels. Scale bars = 3mm.

E:\Paper\First Author Papers\Interface 2019\Figures\Updated Figure\SD_Figure_2.tif

**Figure S2:** Peak enhancement (PE), representative of blood volume, in the GD18 rat placenta from our pixel-wise TIC analysis (a), and from TICs fit after averaging the CEUS signal in 2x2 (b), 4x4 (c), and 8x8 (d) sized kernels overlaid on B-mode US image of anatomy. The mean PE (data shown on a log scale) and normalized variance in the placenta are comparable at each kernel size, demonstrating the accuracy of our approach. Scale bars = 3mm.

E:\Paper\First Author Papers\Interface 2019\Figures\Updated Figure\SD_Figure_3.tif

**Figure S3:** Parametric images of mean transit time (MTT) overlaid on B-mode US images of a GD18 rat placenta. MTT was calculated from a TIC fit from our pixel-wise analysis (a), and after averaging the CEUS signal in 2x2 (b), 4x4 (c), and 8x8 (d) sized kernels. Mean MTT and normalized variance in the placenta both increase in the larger kernel sizes, likely due to the averaging of the CEUS signal. Scale bars = 3mm.