The objective is to estimate depth from a single intensity image. 

- Active sensors: Laser depth scanners, time-of-flight cameras, active pattern sensors etc.
- Passive techniques: stereo, structure from motion, depth from defocus etc.
- Depth maps are useful in various 3D based applications such as automatic driving assistance, robotic navigation, 3D television, scene classification, dehazing, object recognitions etc.

Multi-scale deep network [1, 2].
- Fully convolutional neural network (FCNN) [3].
- Deep CNN with continuous random fields [4, 5].
- Deeper residual convolutional neural network [6].
- Auto-encoder with skip connection convolutional neural network embedding focal length [7].

The hourglass module is used to incorporate features from different scales.
- The residual blocks are labeled as R1, R2, ... R9, each of which consists of three convolutional layers.

The loss function can be represented the following loss function:

\[ L(\xi, x) = D_f^2(\xi, x) + \frac{1}{2} MSE(\xi, x) \]

This combination of perceptual loss as well as MSE loss increases accuracy and improved the perceptual quality of the predicted depth map.

PROPOSED APPROACH
- Block diagram of our network for depth estimation is consisted of multiple stacked layers with hourglass in encoder-decoder.

-主动传感器：激光深度扫描仪、时间-of-飞行相机、主动模式传感器等。
-被动技术：立体、结构从运动、深度从失焦等。
-深度图在各种3D基于应用中非常有用，如自动驾驶辅助、机器人导航、3D电视、场景分类、去霧、物体识别等。

多尺度深度网络 [1, 2]。
-全连接卷积神经网络（FCNN） [3]。
-深度CNN与连续随机场 [4, 5]。
-更深的残余卷积神经网络 [6]。
-自动编码器与跳接卷积神经网络嵌入焦长度 [7]。

小时玻璃模块用于整合不同尺度的特征。
-残余块标记为 R1，R2，... R9，每个由三个卷积层组成。

损失函数可以表示为以下损失函数：

\[ L(\xi, x) = D_f^2(\xi, x) + \frac{1}{2} MSE(\xi, x) \]

这种结合了感知损失以及均方误差损失，增加了准确性并提高了预测深度图的感知质量。