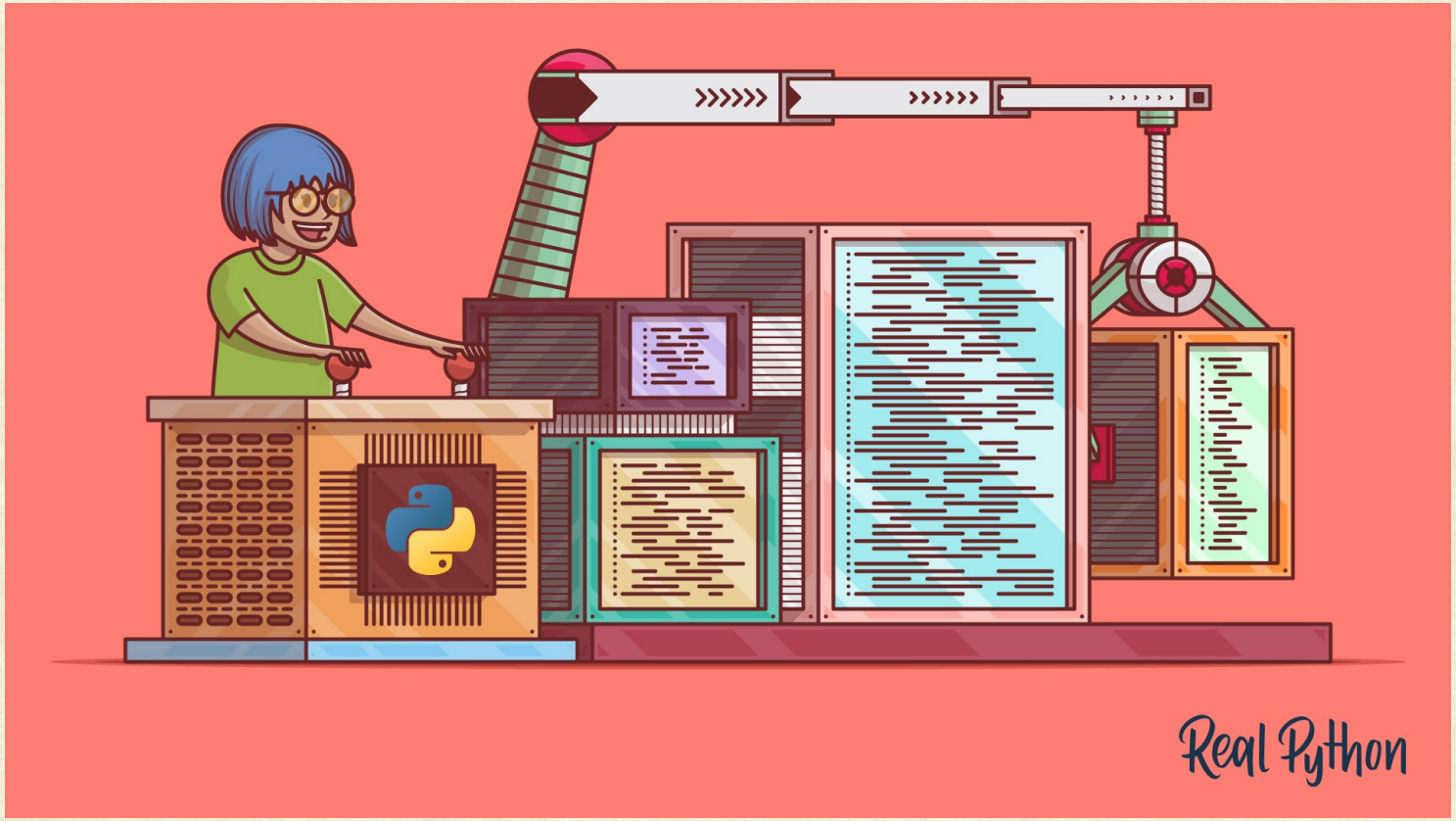
Lecture 8: Modules



Anoop M. Namboodiri

IIIT Hyderabad

Creating/Using Modules

- ```
  import person
  p = person.Person("Abc",25)
  p.show()
  print("pi=",person.pi)
  print(dir(person))
  ```

- ```
  import person as per
  p = per.Person("Abc",25)
  p.show()
  print("pi=",per.pi)
  ```

- ```
  from person import Person, pi
  p = Person("Abc",25)
  p.show()
  print("pi=", pi)
  ```

person.py

```
pi = 3.1416

class Person:
  def __init__(self, name, age):
    self.name = name
    self.age = age

  def show(self):
    print(f"Name={self.name}")
    print(f"Age={self.age}")

def add3(a,b,c):
  return(a+b+c)
```
```

Python Module: *math*

sin, asin, cos, acos, tan, atan, sinh, asinh, cosh, acosh, tanh, atanh, atan2, log, log10, log2, log1p, ceil, floor, remainder, sqrt, exp, pow, factorial, perm, comb, lcm, gcd, fabs, copysign, degrees, dist, e, pi, erf, erfc, expm1, fmod, frexp, fsum, gamma, hypot, inf, isclose, isfinite, isinf, isnan, isqrt, ldexp, lgamma, modf, nan, nextafter, prod, radians, tau, trunc, ulp

Python Module: *random*

```
random, randint, randbytes, randrange, choice, choices,
sample, shuffle, getrandbits, gauss, uniform, triangular,
getstate, setstate, sample, seed, betavariate, expovariate,
gammavariate, lognormvariate, normalvariate, paretovariate,
vonmisesvariate, weibullvariate
```

Python Module: *numpy*

abs, absolute, add, add_docstring, add_newdoc, add_newdoc_ufunc, all, allclose, alltrue, amax, amin, angle, any, append, apply_along_axis, apply_over_axes, arange, arccos, arccosh, arcsin, arcsinh, arctan, arctan2, arctanh, argmax, argmin, argpartition, argsort, argwhere, around, **array**, array2string, array_equal, array_equiv, array_repr, array_split, array_str, asanyarray, asarray, asarray_chkfinite, ascontiguousarray, asfarray, asfortranarray, asmatrix, atleast_1d, atleast_2d, atleast_3d, average, bartlett, base_repr, binary_repr, bincount, bitwise_and, bitwise_not, bitwise_or, bitwise_xor, blackman, block, bmat, bool8, bool_, broadcast, broadcast_arrays, broadcast_shapes, broadcast_to, busday_count, busday_offset, busdaycalendar, byte, byte_bounds, bytes0, bytes_, c_, can_cast, cast, cbrt, cdouble, ceil, cfloat, char, character, chararray, choose, clip, clongdouble, clongfloat, column_stack, common_type, compare_chararrays, compat, complex128, complex64, complex_, complexfloating, compress, concatenate, conj, conjugate, convolve, copy, copysign, copyto, core, corrcoef, correlate, cos, cosh, count_nonzero, cov, cross, csingle, ctypeslib, cumprod, cumproduct, cumsum, datetime64, datetime_as_string, datetime_data, deg2rad, degrees, delete, deprecate, deprecate_with_doc, diag, diag_indices, diag_indices_from, diagflat, diagonal, diff, digitize, disp, divide, divmod, dot, double, dsplit, dstack, dtype, e, ediff1d, einsum, einsum_path, emath, empty, empty_like, equal, error_message, errstate, euler_gamma, exp, exp2, expand_dims, expm1, extract, eye, fabs, fastCopyAndTranspose, fft, fill_diagonal, find_common_type, finfo, fix, flatiter, flatnonzero, flexible, flip, fliplr, flipud, float16, float32, float64, float_, float_power, floating, floor, floor_divide, fmax, fmin, fmod, format_float_positional, format_float_scientific, format_parser, frexp, from_dlpack, frombuffer, fromfile, fromfunction, fromiter, frompyfunc, fromregex, fromstring, full, full_like, gcd, generic, genfromtxt, geomspace, get_array_wrap, get_include, get_printoptions, getbufsize, geterr, geterrcall, geterrobj, gradient, greater, greater_equal, half, hamming, hanning, heaviside, histogram, histogram2d, histogram_bin_edges, histogramdd, hsplit, hstack, hypot, i0, identity, iinfo, imag, in1d, index_exp, indices, inexact, inf, info, infty, inner, insert, int0, int16, int32, int64, int8, int_, intc, integer, interp, intersect1d, intp, invert, is_busday, isclose, iscomplex, iscomplexobj, isfinite, isfortran, isin, isinf, isnan, isnat, isneginf, isposinf, isreal, isrealobj, isscalar, issctype, issubclass_, issubdtype, issubsctype, iterable, ix_, kaiser, kron, lcm, ldexp, left_shift, less, less_equal, lexsort, lib, linalg, linspace, little_endian, load, loadtxt, log, log10, log1p, log2, logaddexp, logaddexp2, logical_and, logical_not, logical_or, logical_xor, logspace, longcomplex, longdouble, longfloat, longlong, lookfor, ma, mask_indices, mat, math, matmul, matrix, matrixlib, max, maximum, maximum_sctype, may_share_memory, mean, median, memmap, meshgrid, mgrid, min, min_scalar_type, minimum, mintypecode, mod, modf, moveaxis, msort, multiply, nan, nan_to_num, nanargmax, nanargmin, nancumprod, nancumsum, nanmax, nanmean, nanmedian, nanmin, nanpercentile, nanprod, nanquantile, nanstd, nansum, nanvar, nbytes, ndarray, ndenumerate, ndim, ndindex, nditer, negative, nested_iters, newaxis, nextafter, nonzero, not_equal, numarray, number, obj2sctype, object0, object_, ogrid, oldnumeric, ones, ones_like, os, outer, packbits, pad, partition, percentile, pi, piecewise, place, poly, poly1d, polyadd, polyder, polydiv, polyfit, polyint, polymul, polynomial, polysub, polyval, positive, power, printoptions, prod, product, promote_types, ptp, put, put_along_axis, putmask, quantile, r_, rad2deg, radians, random, ravel, ravel_multi_index, real, real_if_close, rec, recarray, recfromcsv, recfromtxt, reciprocal, record, remainder, repeat, require, reshape, resize, result_type, right_shift, rint, roll, rollaxis, roots, rot90, round, round_, row_stack, s_, safe_eval, save, savetxt, savez, savez_compressed, sctype2char, sctypeDict, sctypes, searchsorted, select, set_numeric_ops, set_printoptions, set_string_function, setbufsize, setdiff1d, seterr, seterrcall, seterrobj, setxor1d, shape, shares_memory, short, show_config, sign, signbit, signedinteger, sin, sinc, single, singlecomplex, sinh, size, sometrue, sort, sort_complex, source, spacing, split, sqrt, square, squeeze, stack, std, str0, str_, string_, subtract, sum, swapaxes, sys, take, take_along_axis, tan, tanh, tensordot, test, testing, tile, timedelta64, trace, tracemalloc_domain, transpose, trapz, tri, tril, tril_indices, tril_indices_from, trim_zeros, triu, triu_indices, triu_indices_from, true_divide, trunc, typecodes, typename, ubyte, ufunc, uint, uint0, uint16, uint32, uint64, uint8, uintc, uintp, ulonglong, unicode_, union1d, unique, unpackbits, unravel_index, unsignedinteger, unwrap, use_hugepage, ushort, vander, var, vdot, vectorize, version, void, void0, vsplit, vstack, w, warnings, where, who, zeros, zeros_like

Numpy

- Array:
  - Creation, indexing, slicing
  - Shape(), reshape()
  - array.copy(), array.view()
  - Iterating, nditer(arr), ndenumerate(arr)
  - concatenate((arr1,arr2),axis=1)
  - array_split(arr, numparts)
  - Search: np.where(arr%2 == 0)
  - Sort: np.sort(arr)
  - Filter: arr(filter_array)

Universal Functions

- Universal functions (uFunc) of numpy can be used to operate on all elements of a container efficiently (vectorization).
- np.add(list1,list2), np.subtract(arr1,arr2)
- multiply, divide, power, mod, remainder
- np.concatenate(…)
- trunc, ceil, floor, around,
- sum, cumsum,
- Trigonometric, LCD, GCM, Set operations