Building a universe from its fundamental building block.

This text can be thought of as the naive way to explore ideas around what makes up the universe. I guess some will call it banal. But it is an attempt to boil down these issues to the simplest possible way to describe them and decide whether it is possible to describe the universe from the bottom up. And then point out some possible ways to make structures of these simplest bits that matches what we observe. It is however not an attempt to answer how everything actually works.

Discrete or continous?
The first issue we must sort out is; is the universe continous or discrete?
Absolutely everything is built on top of something that is either continous or discrete. What it actually is doesn't matter but whether one it is it has profound implications. What is then the implications of a continous universe? The first thing that strikes me is that the information density in a continous universe is infinite. If it is so, then we must have a truly "vectorized" universe made up by elegant algorithms that explain everything with infinite resolution. Which is both very interesting and somewhat comforting. But what are these algorithms, and how did they come into existence? Though, a not very scientific argument on my behalf i'll admit, such a complex background feels more like a belief in an omnipotent will than a sound argument for a continous universe. A discrete universe on the other hand, gives us the oppertunity to get rid of infiniteness and a way to construct a universe consisting of some very simple smallest bits. It will even in a certain way be possible to get rid of 0, or more correctly get rid of void. Every value that means anything for the universe is something rather than nothing.

Considerations of finiteness
Is the universe finite or infinite in either spatial or temporal dimensions? As we shall see these expressions does a poor job describing what we really mean, but they are something we all know the meaning of, so they will suffice for now. When choosing everything to be discrete we pave the way for some interesting considerations. Let us start with trying to define what the universe consist of. When we focus on a certain blob of information, small like a particle or huge like a universe, bits that have no possibility of interacting are not and will never be interacting and are thus of no interest. We can therefore at least say that the or a universe consists of information bits with a nonzero chance of interacting. With that in mind we can start ponder over what consequenses an infinite universe would have. Every bit would have an infinite number of other bits trying to interact with it as often and fast as possible. It would in a sense be a lot happening in such a universe but the sum of it would be pretty dull. After ruling out a spatial infinite universe then what about infinite lifetime of an universe? Thats a bit harder to tell but let us start with ruling out infinite lifetime with a start or end. To cut it short: The probability to have a finite distance from the start or end in an infinite amount of time is zero. Hence, the universe have got either an infinite life span or a finite one with a start and end. A temporal infinite universe must be constructed with zero probability of evolving in to a state where it is in a stck state. This may of course be possible, but since we as a rule of thumb tries to avoid infinities we will profeten with trying to imagine how a finite one can be conjured up.

If we discover that a finite solution is impossible, then we have to backtrack to the temporal infinite solution.

Conservation of energy
Conservation of energy is a neccessity for vastely stable systems. But that doesn't necessarily means that the underlying framework doesn't gain or loose information. In fact, if we follow the line of thought with a finite lifetime of the universe it has to have the ability to both gain and loose information. But making possible a structure that lasts billions and billions of years without corrupting higher level information requires a remarkable stable system. A temporal infinite universe on the other hand must be truly stable and can not gain nor loose information. That said, every possible combination of the universes bits will have been and will be infinitly many times. A fundamentally stable universe sounds like a nice solution, even though we have to deal with that nasty infinity, but solving the other alternative requires really good error correction algorithms or functionality for handling both gain and loss of information within the lowest level. If it is provable that it is possible then this is the way to go.

Looking for the simplest possible building blocks
The really nice thing with a discrete universe is that we can figure out what the simplest system for describing every larger structure is. And even if it is impossible to actually probe these tiniest bits it must be true if they can describe every larger structure and phenomena. And the simplest system for describing any structure of information must be a binary system. But, since we need to have a truly background independent system we also must add, as a part of the system, a way to relate one bit of information to another. Still to keep it as simple as possible we add a binding to the last bit this bit interacted with. But here we unfortunatly introduced another complicating, but alas necessary, feature - interaction. Interaction is what really defines the system and is of paramount importance. We must also introduce an element of chance, or our system would be terrible static. Again, with a heavy heart we have to seek out the simplest possible way to handle this. For example we could start with a system which have a fifty percent chance of interacting with the last bit it interacted with. If it does nothing happens, but if it misses it proceeds to the next binding and tries a fifty-fifty hit-miss there. When it hits it is reconfigured to point at the latest interacting bit. An interesting point here is, do we have to introduce functionality to prevent eternal loops? One way to do it could just be to add the rule that a bit can't interact with itself. The difficult part is keeping it background independent and as simple as possible. At this point we don't really know that this is a sufficient way to describe everything but it is a nice and clean place to start. If we prove that this is the simplest system and that it is possible to express every feature in the universe this way, then we have found the universes smallest bits.

Is the universe growing?
For a temporal finite universe with a start and end, the amount of information contained in the universe must be able to change. How this mechanisms is supposed to work is difficult to figure out, and quite possibly it doesn't happen at all. But if we should start considering it we could try adding a bit when there is no, or no possible connection when trying to interact with another bit. For example when a bit tries to form a connection with itself we add another bit. It does not matter if this bit actually exists or not, for the universe it is as it just pops up in existence. But if it has a connection to other bits it will certainly complicate things. Should this be a working model figuring out how our universe started boils down to why did that first bit pop up in the first place?

Constructing space
Our perception of space or at least our day-to-day idea of it is probably wrong. When constructing space from this kind of background independent structure, space must be a result of how bits interact with each other - like everything else of course. That one point is a distance away from another means that the information representing the point of interest must traverse more bindings or structures to be able to interact with the other point of interest. The longer away the points is from each other the more information must be traversed to get there. One very interesting feature with space is that when you have started to move in a direction then you will continue to do so until some event or structure takes away the action contained in the loop that makes up the movement. The relation between space and matter is also interesting and one of the defining features of space. It seems that it is constructed in a way that when interacting with matter it becomes a kind of denser and tend to attract more matter to interact with it. Aka space curves around matter.

Time from action
Time is probably the most or one of the most basic features of the universe. And it seems that we at best have a very vague idea of what time really is. Even though it permeates all our tools that we use to describe the world around us. Since we here try to describe the universe in a background independent manner, time must arise from the same basic elements as everything else and must at the lowest level be a result of interaction between the bits. Aka, one interaction and time ticks one atomic unit. If an outside observer of an universe was possible, and the lifetime is finite, the whole history of the universe would be over in an eyeblink. In fact it would have no binding to outside time at all - or anything else for that matter - and live its life in an unmeasurable time blink.

Building larger structures
If it turns out that we really can describe everything with a discrete simple background independent system, then both forces and matter and the rules they obey must be built of the same ingredients. How can we then explain that observe the same physical laws whereever we look? Do we have to introduce even more complexity to our still quite nice and clean construction? Fortunatly we don't. And there are only two mechanisms that makes this possible.
And one of them do have to use the other. So, the only possible solution for a rule in a background independent universe, commonly known as a law of nature, if it truly is the same all over the universe is that it actually is the same structure being queried. The other method, which is to be used if one wants to build something that is allowed to vary slightly locally. Is to use the first method as a factory method to churn out identical copies of a structure. These can in theory at least vary locally, but the global method will change everything, needlessly to say, globally. So structures that are almost the same but are unstable over time are probably churned out by a factory method and structures that if they change they do so globally are actually a result of the same data.
The idea of querying data structures is interesting and may open for a slightly different explanation of different phenomena. For example like the double slit experiment. Instead of thinking that the particle or wave traverse every possible trajectory to produce the interference pattern it could be a result of how the querying itself affects the outcome when we do not know which path the particle took. Knowing that a particle don't use a specific path is also a result of querying which affects the outcome.

Exchange of information and maximum speed limit
The fact that we have an upper speed limit concerning how fast we can move information relative to space is also an interesting clue in the search of how the universe is constructed. We have already thouched the discussion on how particles move relative to

space whithout needing more energy to keep on with the same velocity. But this upper speedlimit must mean that the information exchange needed to represent movement has used up all the availble bandwith. And even taken up bandwidth that makes time tick. Which also hints at a time functionality which requires more complex structures than just elementary bits that interacts.

Entanglement in a time and spaceless environment
All that takes to move in space is to exchange some bits of information between a lump of information, for example a particle and the mesh of related information that makes up space. And when two structures interacts it is basicly the same thing that happens. They start exchanging information. And since we have constructed a background independent universe, these interactions are stored within the structures themselfes. Which means that there is a possibility that the structure can continue to communicate even after they have been separated by space. The connection is fragile and easily broken when a more major event than merely moving in space takes place. This gives us more important clues about how this is stitched together.

The problem of initial entropy
Every attempt to discuss how our universe works runs into serious trouble when trying to work out how it started with very low entropy. For a universe with a infinite lifespan one could possibly wait to get lucky and would have been an infinite number of times. In a finite universe, both spatial and temporal, as we have discussed, which must start with one bit. Could this be the initial exceptionally low entropy we have been looking for? But what happens then when the universe itself evaporates?

To sum it up
The ideas presented does not actually overthrow any other theories nor make any spectacular predictions, although these bits actually seems to favor string theory as they tend to curl up in oscillating loops, but anyway - the arguments do make a strong case for it from bit and as a bonus we have a definition of a universe: A universe is a collection of bits with a nonzero chance of interacting. And from those simple bits we can construct everything we observe. Why one should make a big fuss about what the bits that make up the universe is puzzels me, everything is made up by structures of information and their interactions.